

FIG.1

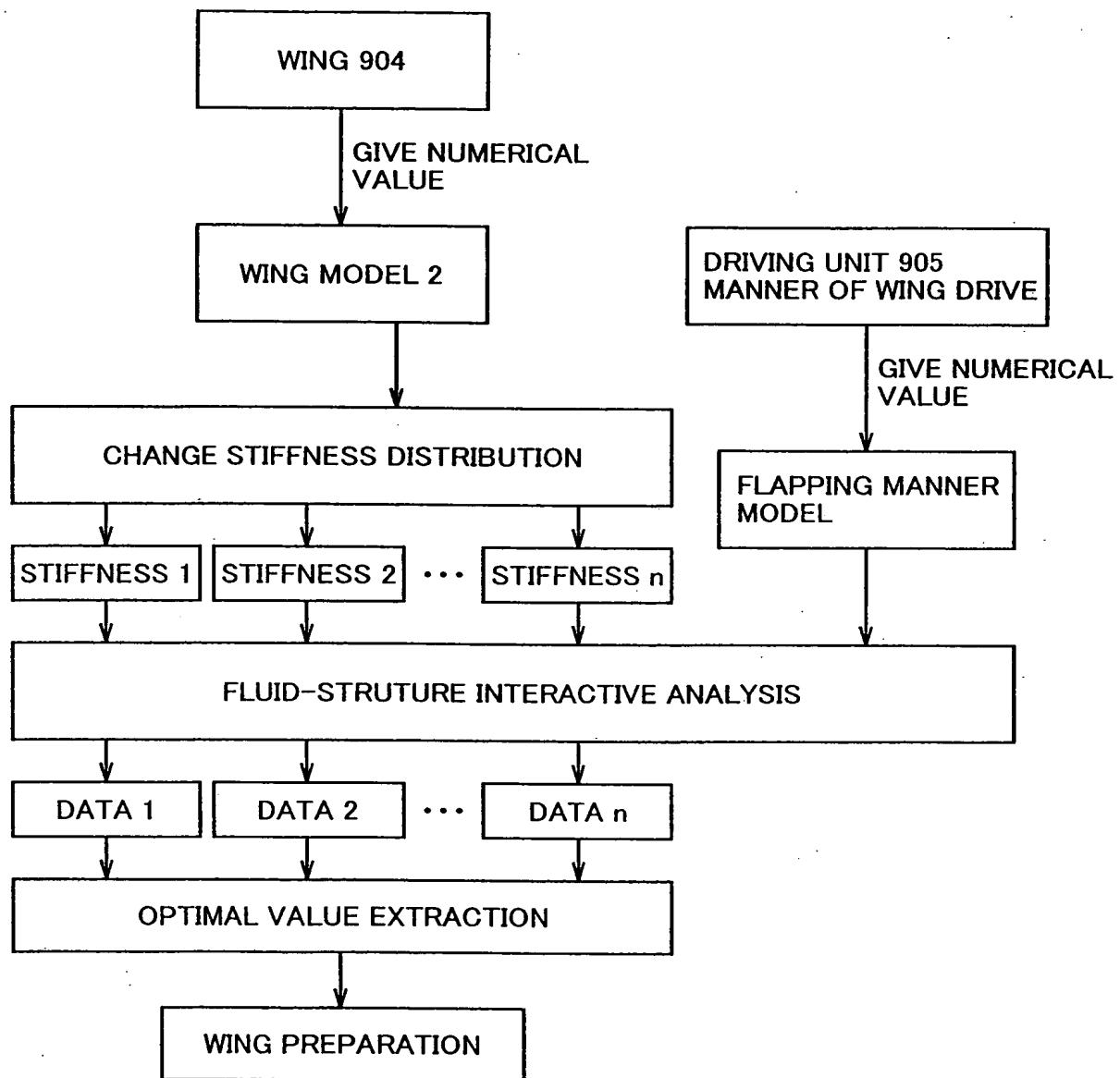


FIG.2

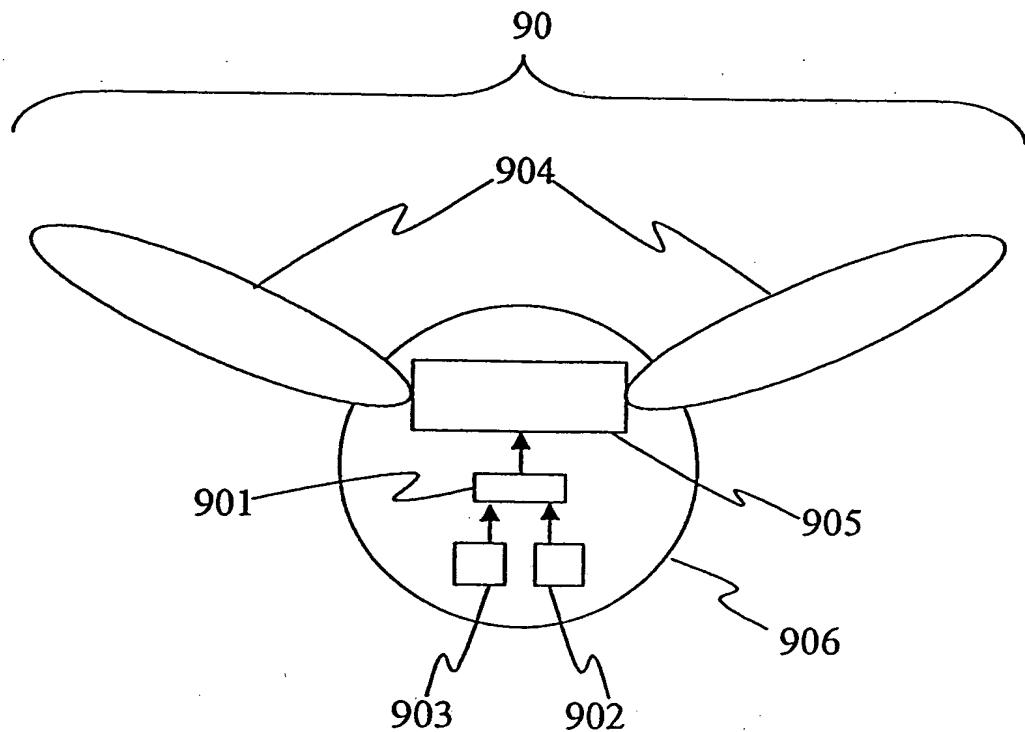


FIG.3

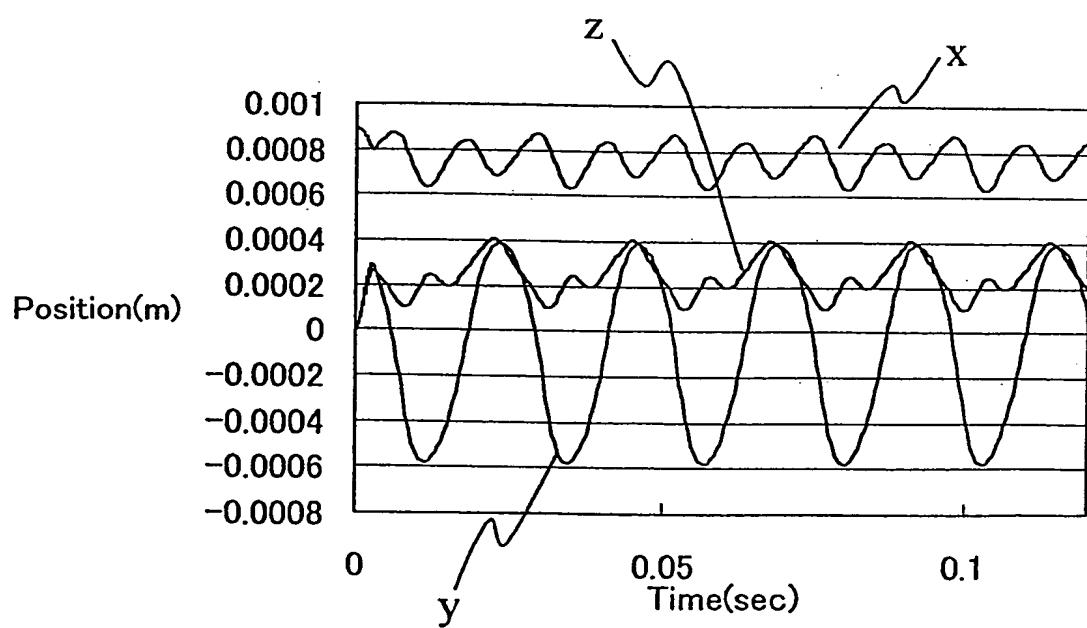


FIG.4

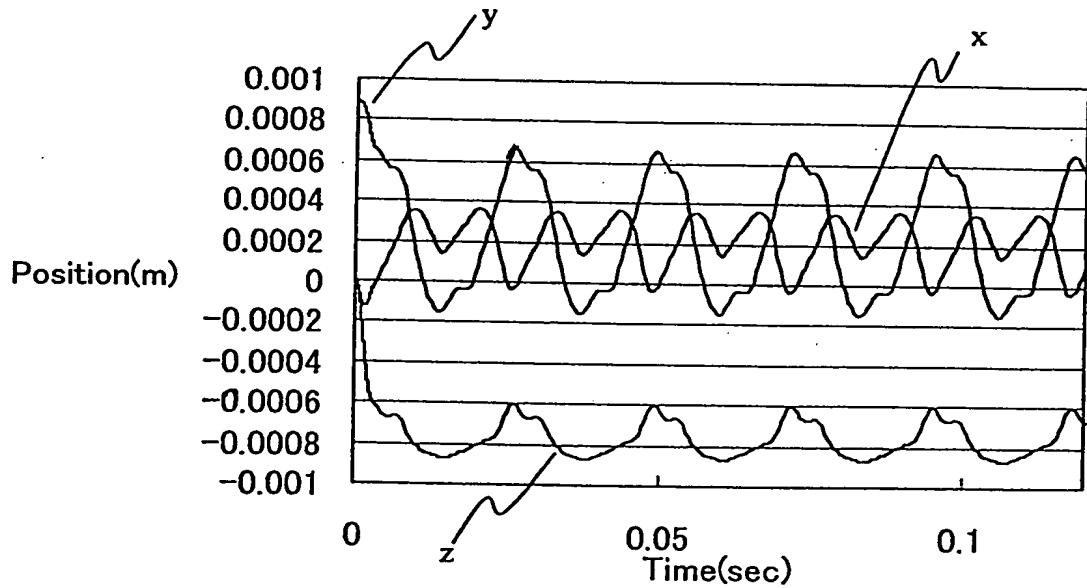
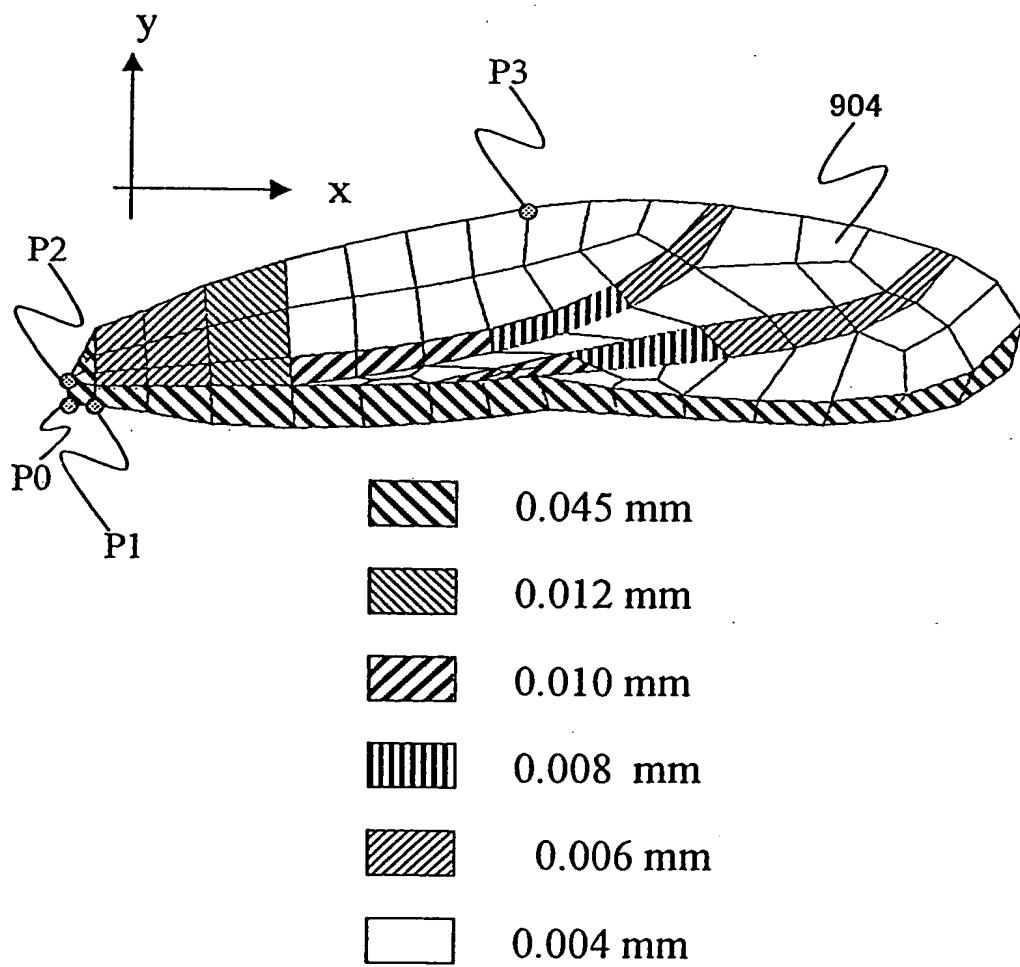
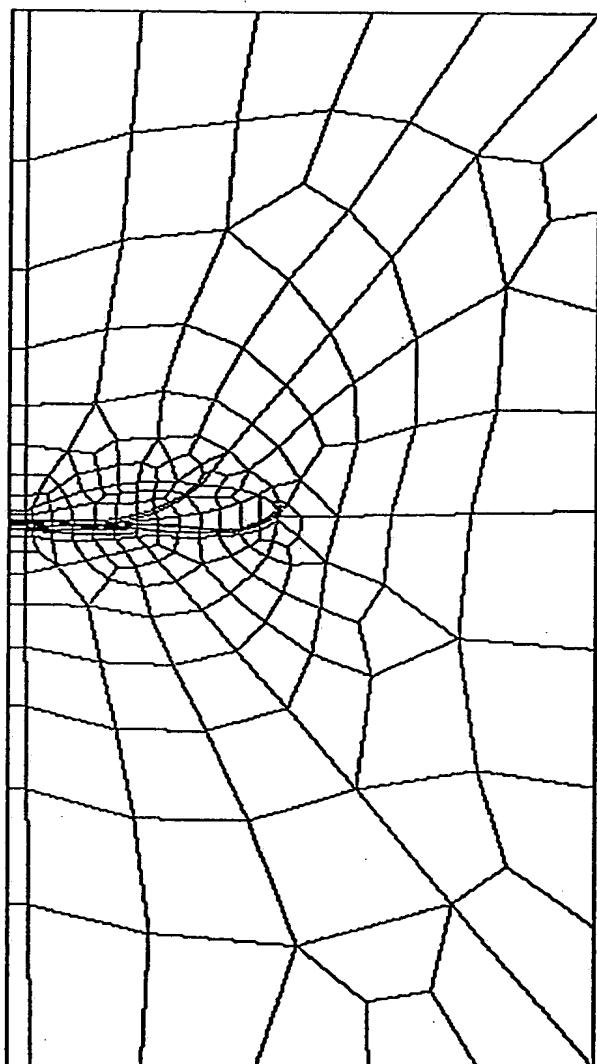


FIG.5



**FIG.6**



**FIG.7**

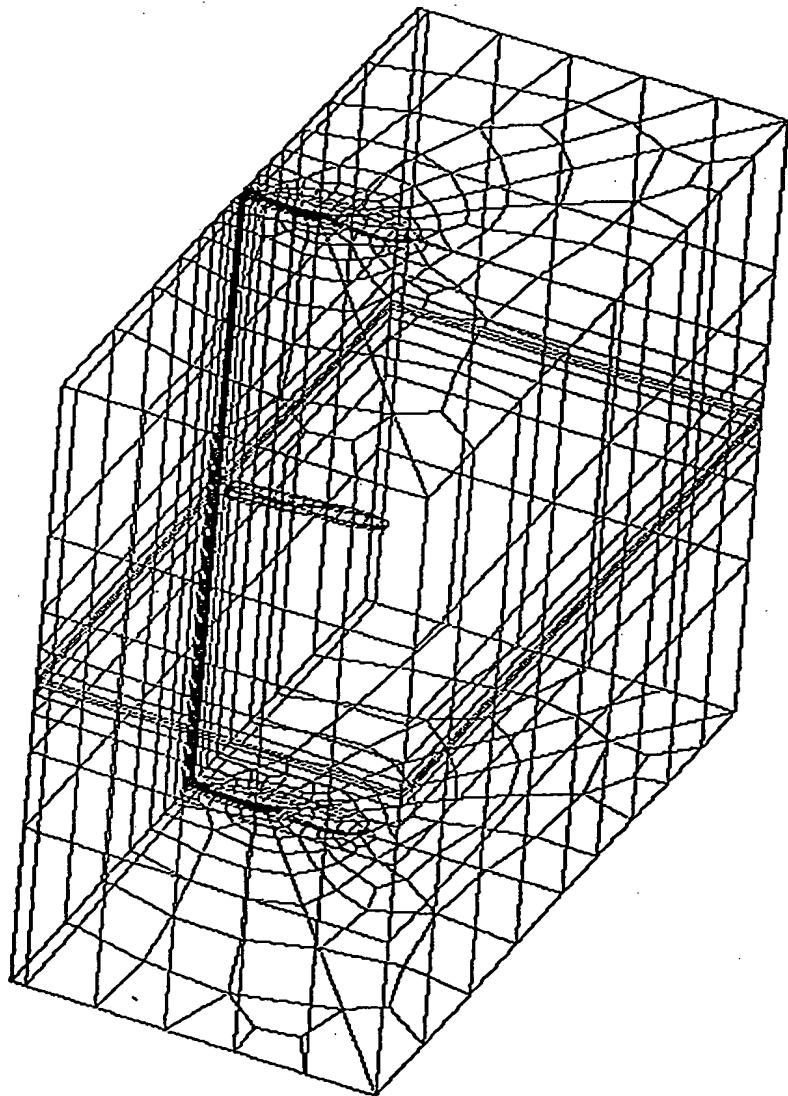


FIG.8

Node 337

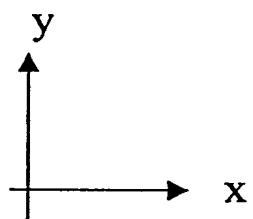
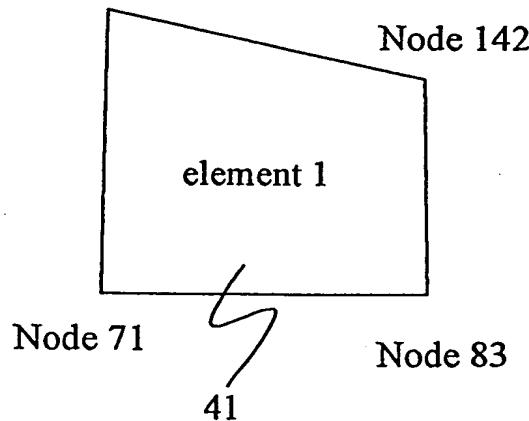


FIG.9

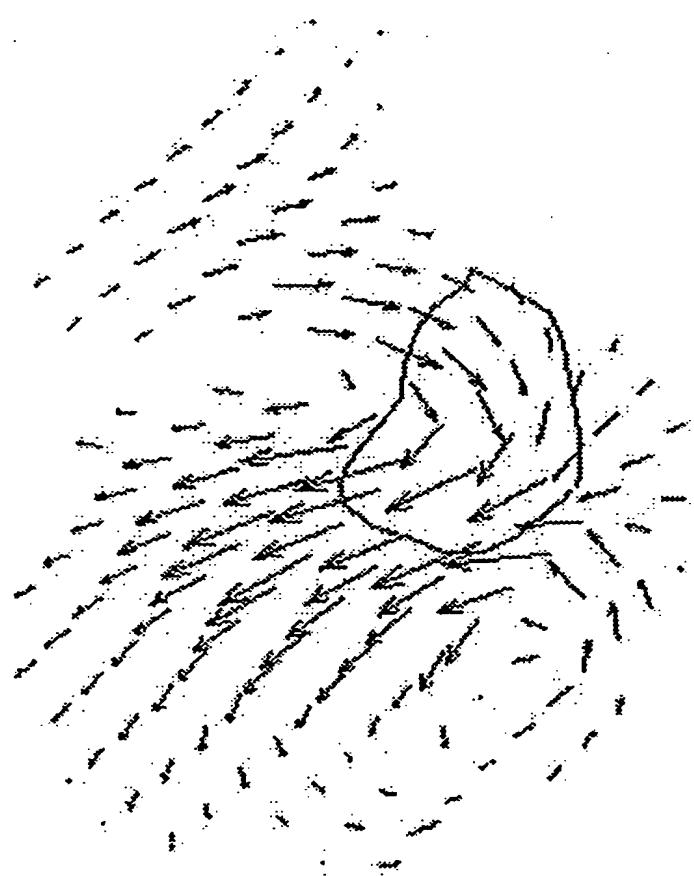


FIG.10

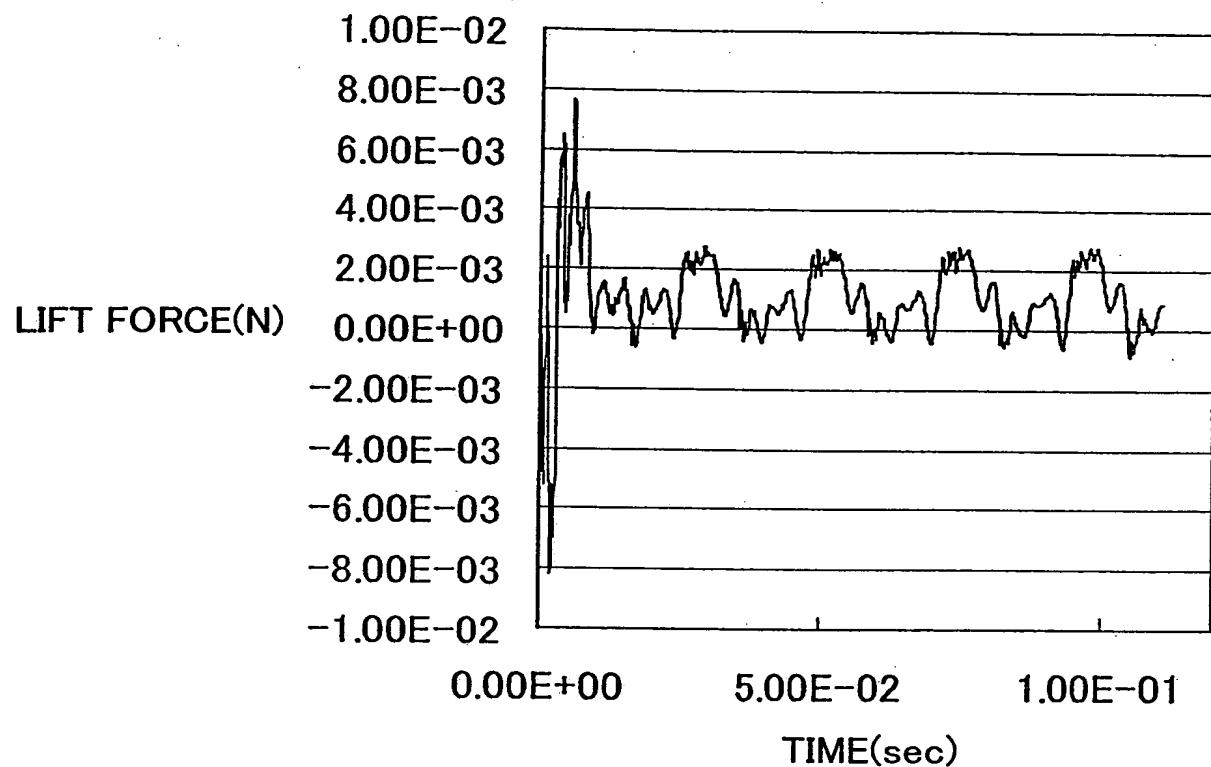


FIG.11

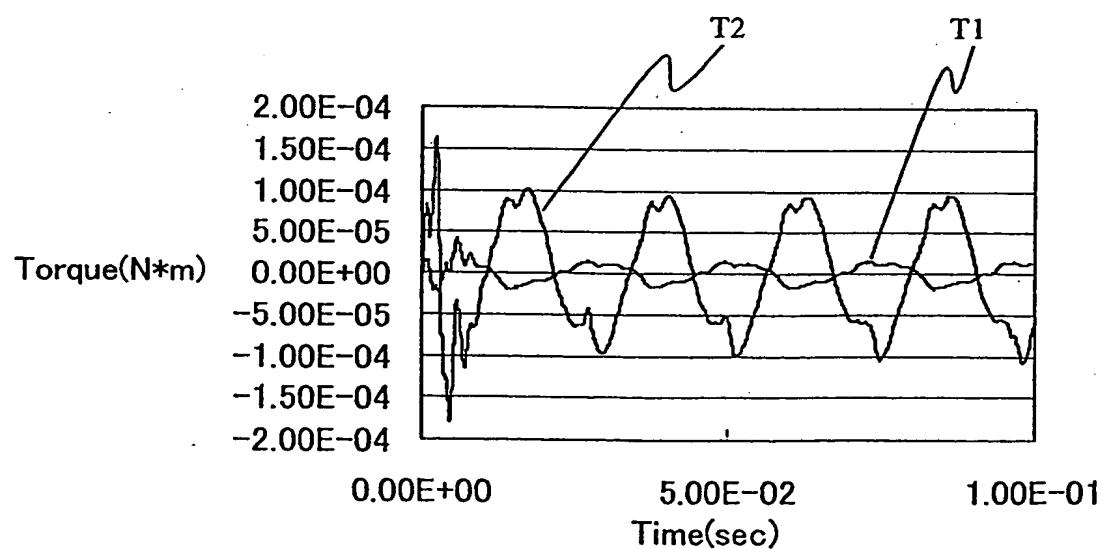


FIG.12

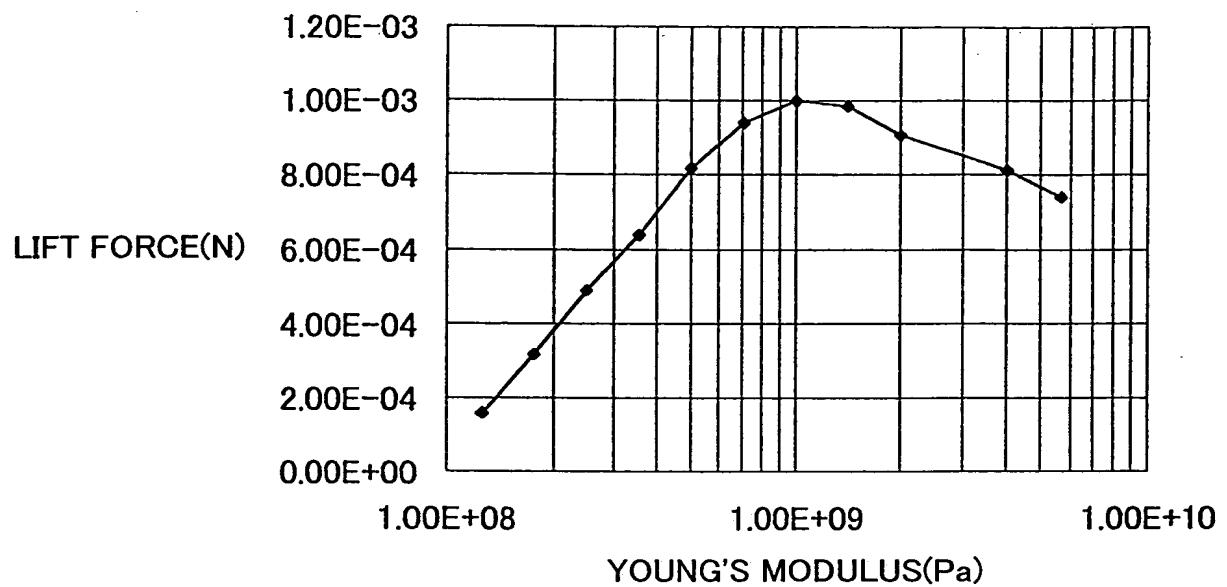


FIG.13

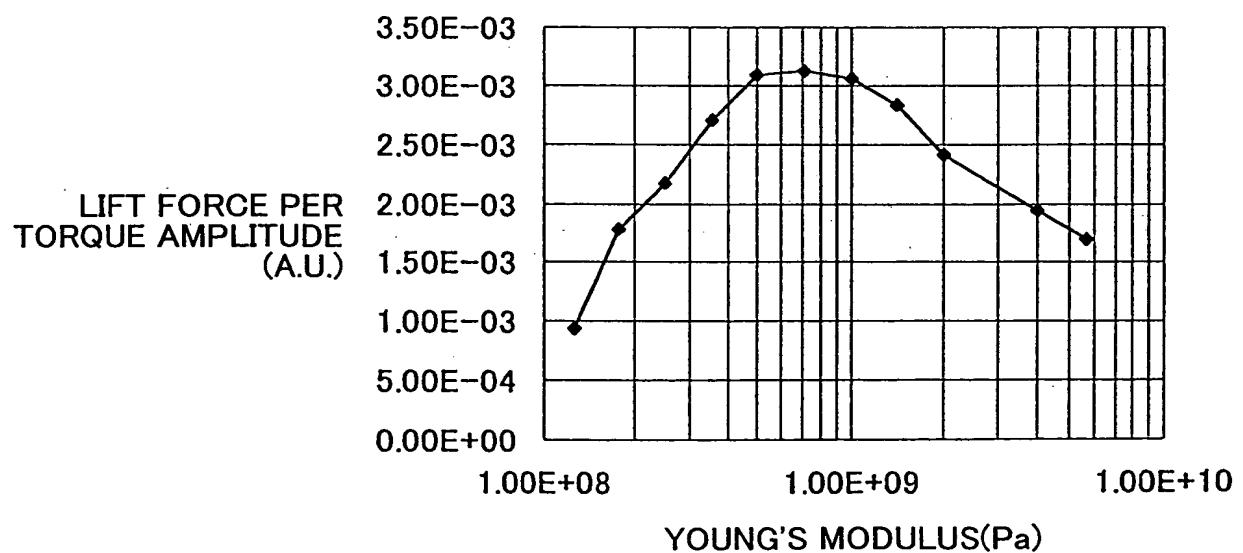


FIG.14

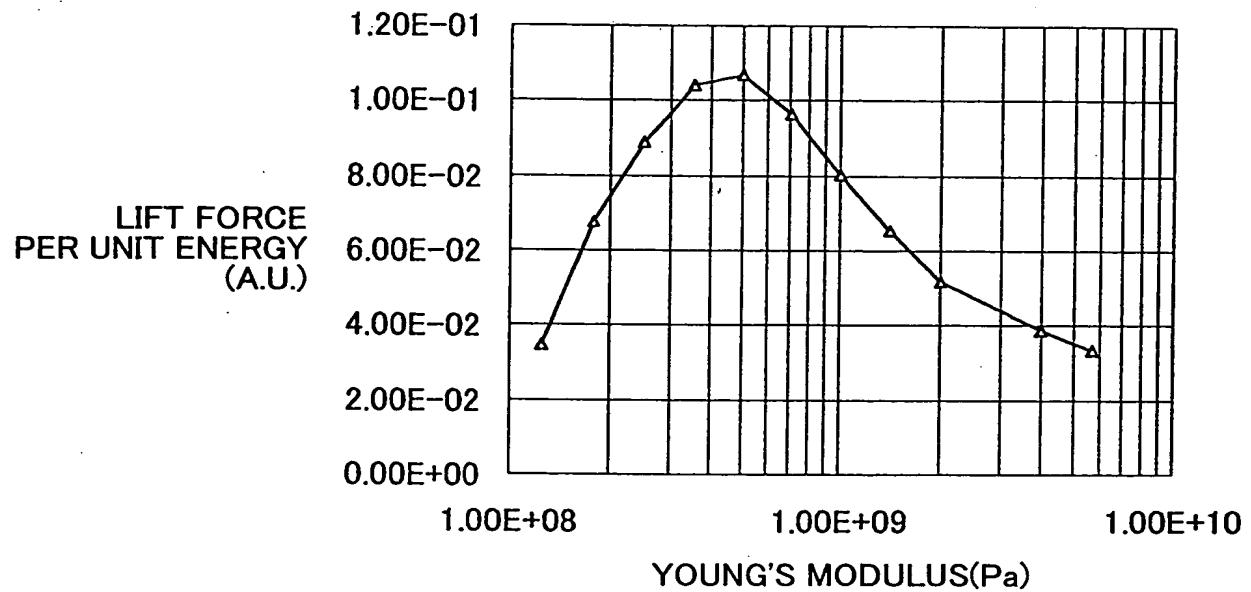


FIG.15

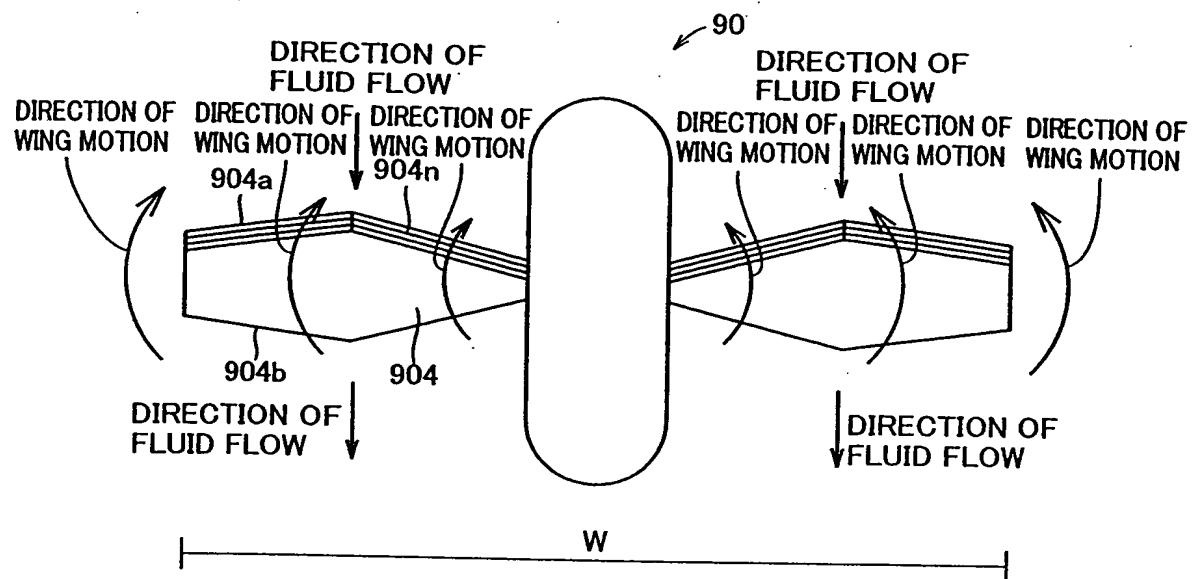


FIG.16

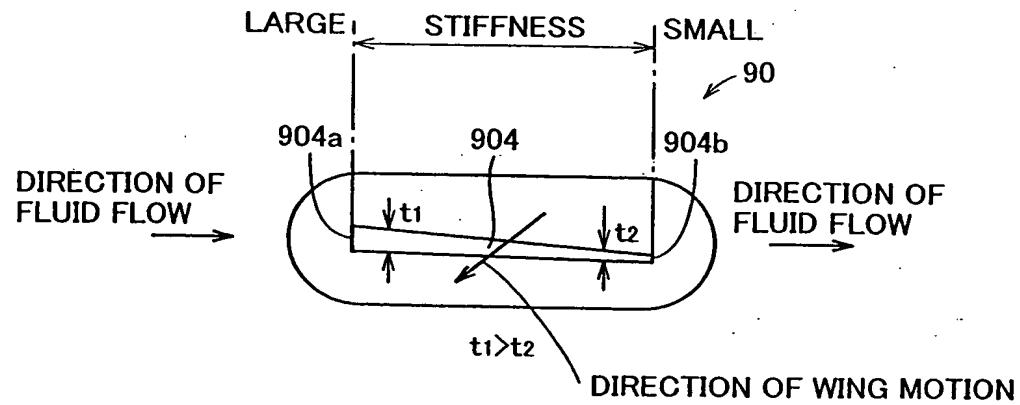


FIG.17

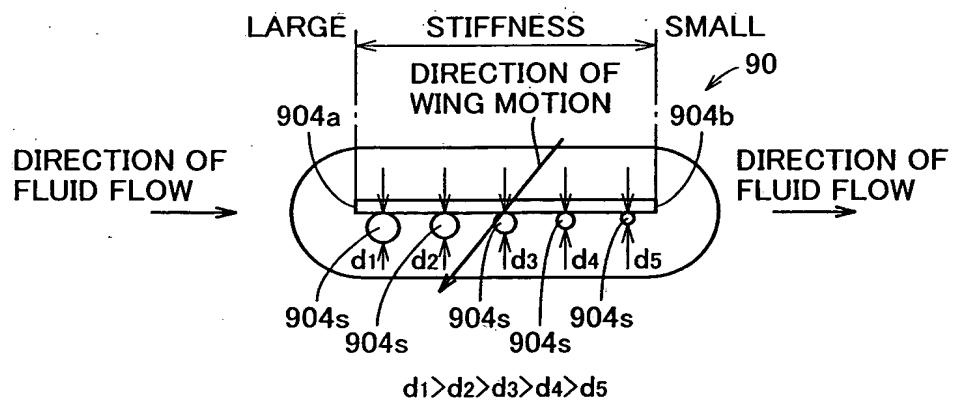


FIG.18

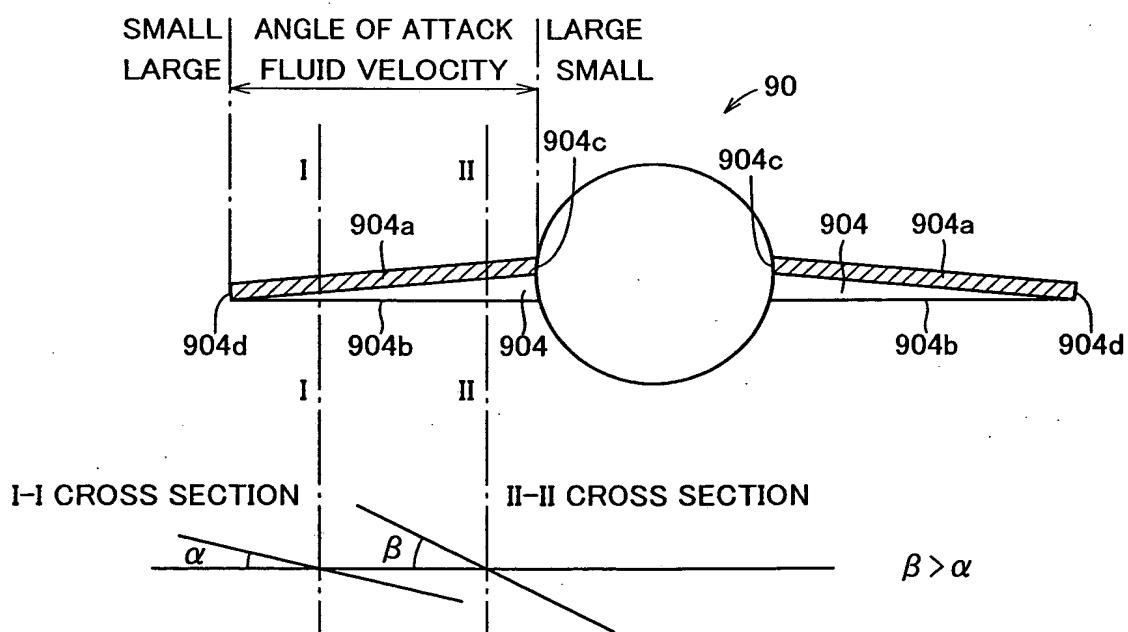


FIG.19

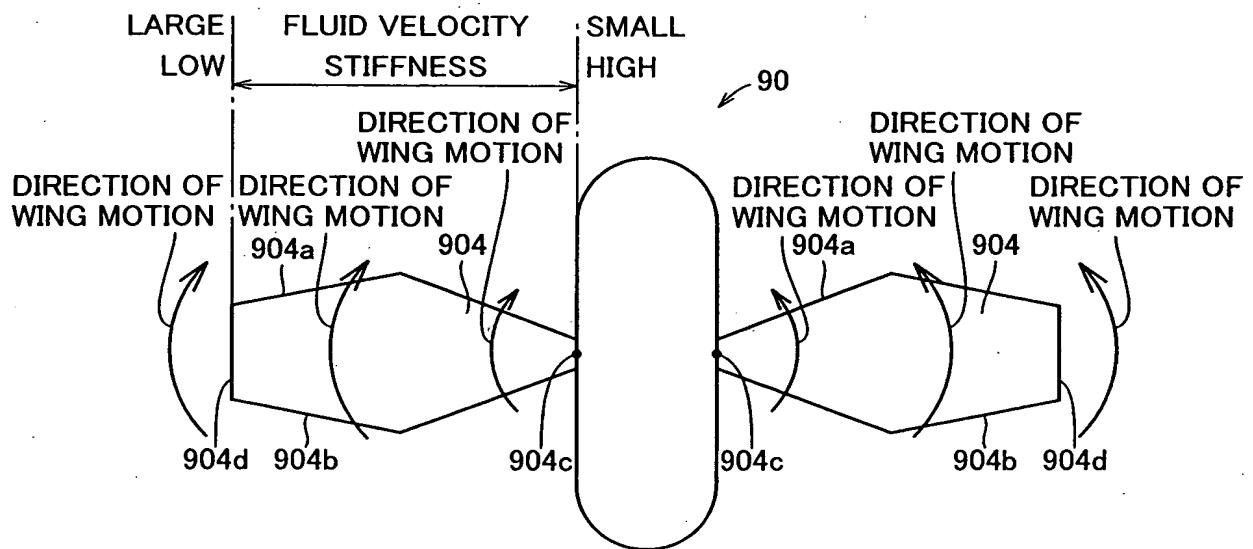


FIG.20

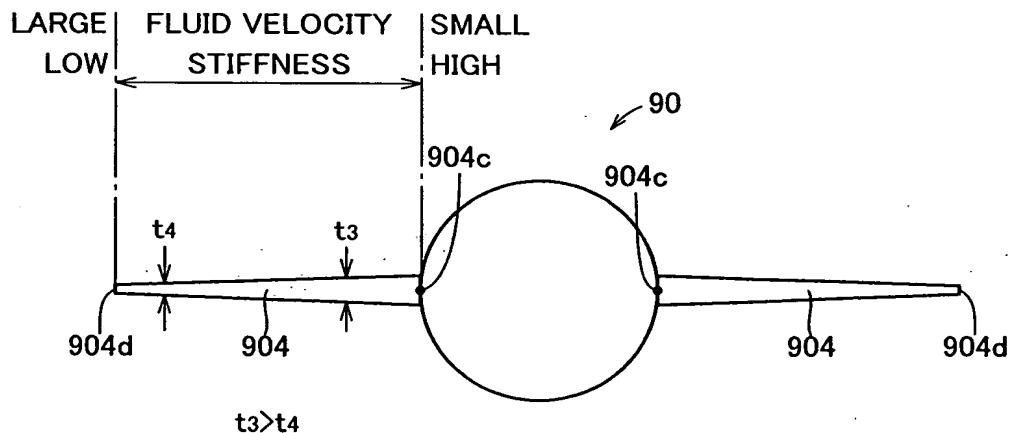


FIG.21

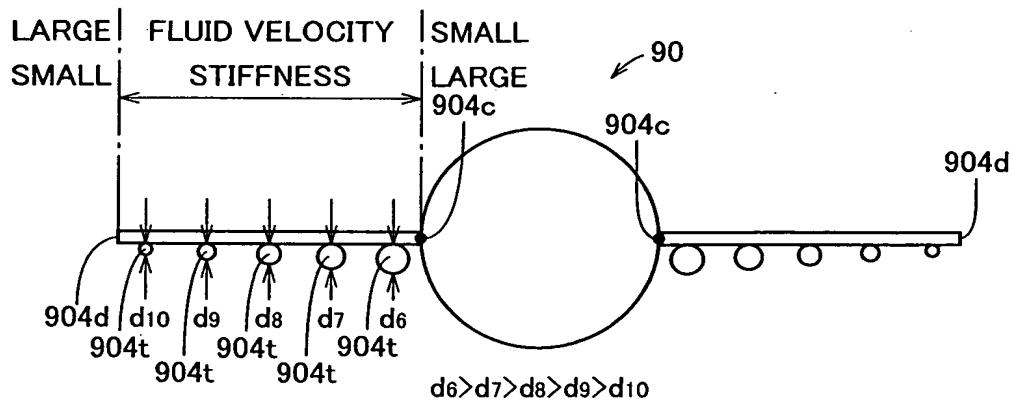


FIG.22

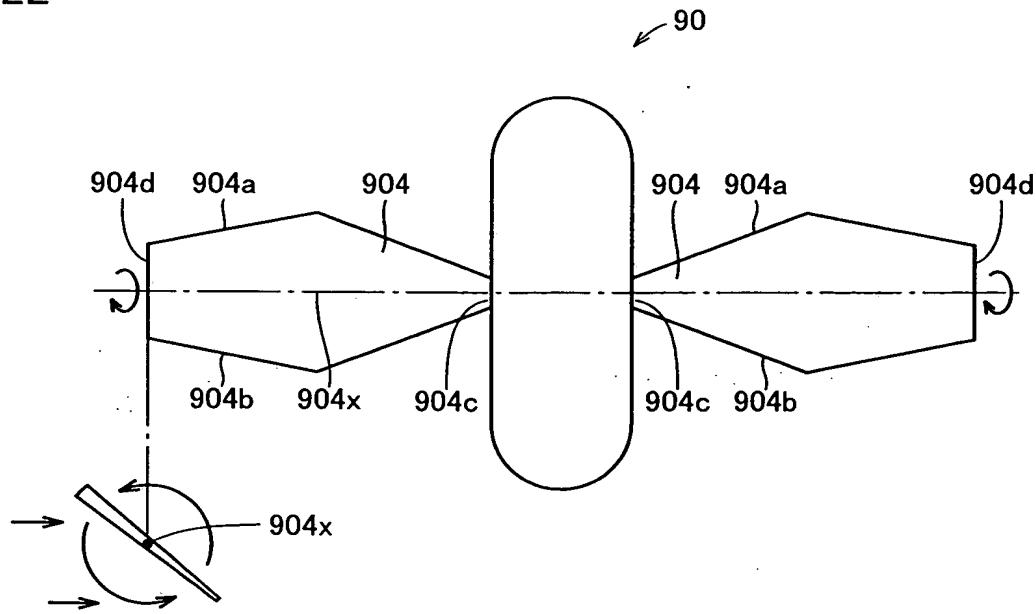


FIG.23

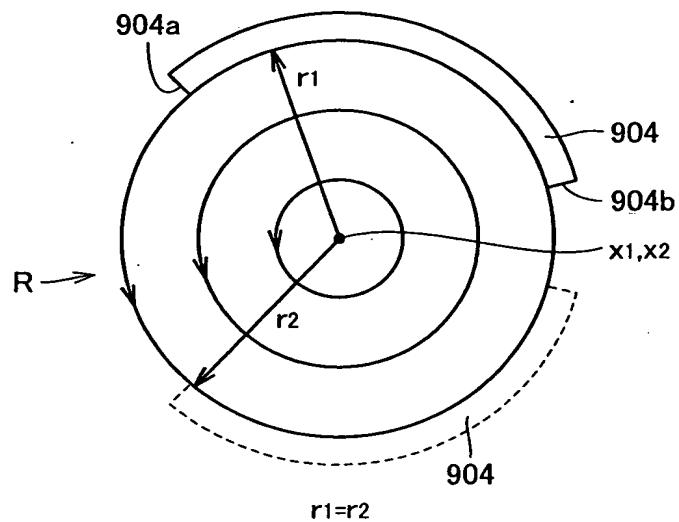


FIG.24

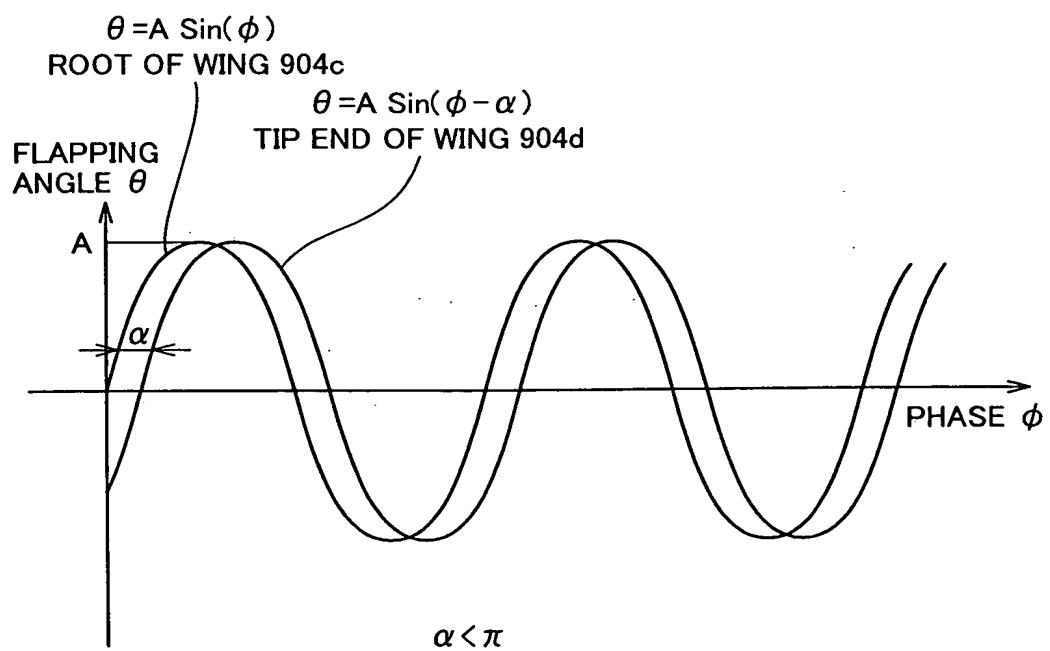


FIG.25

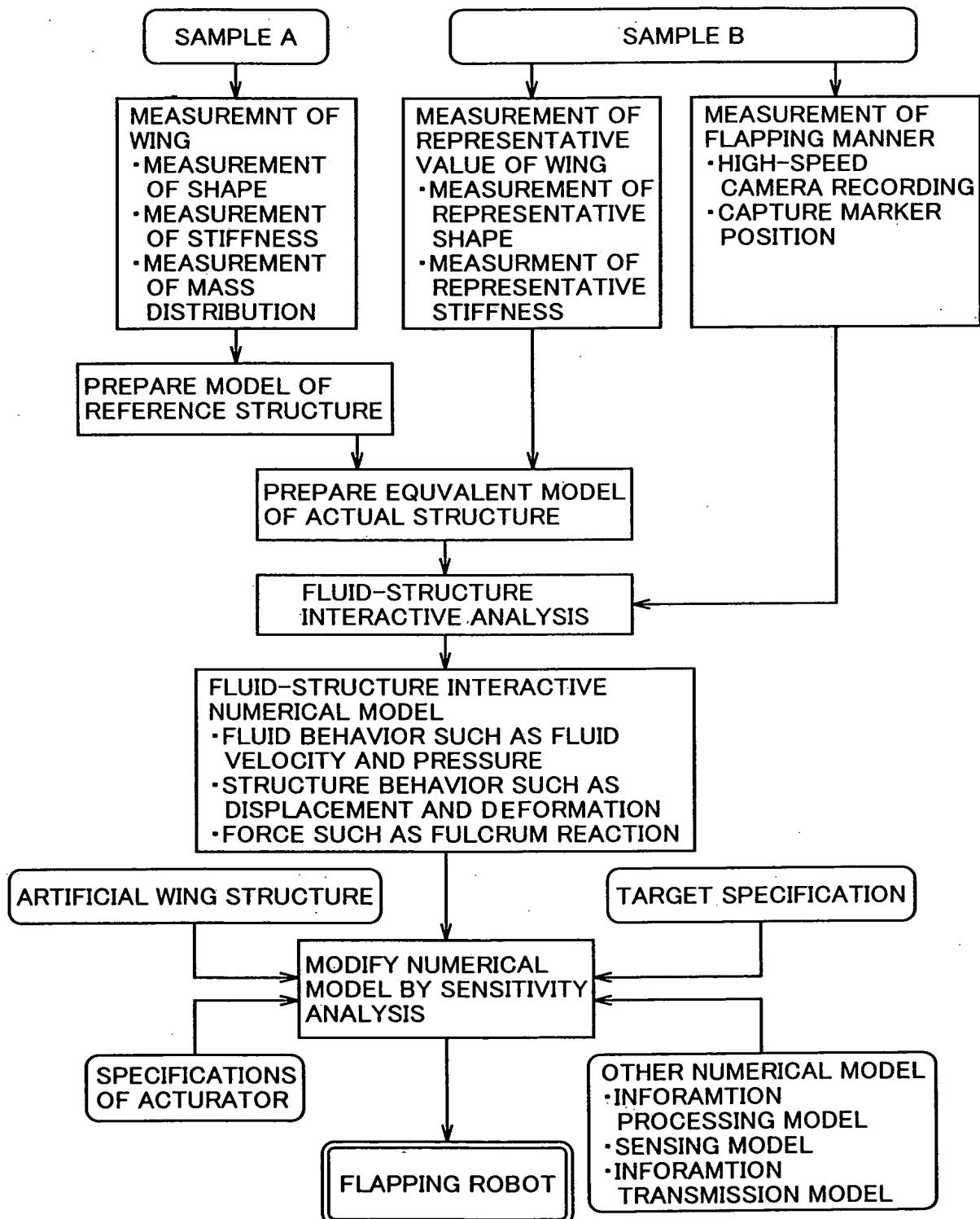


FIG.26

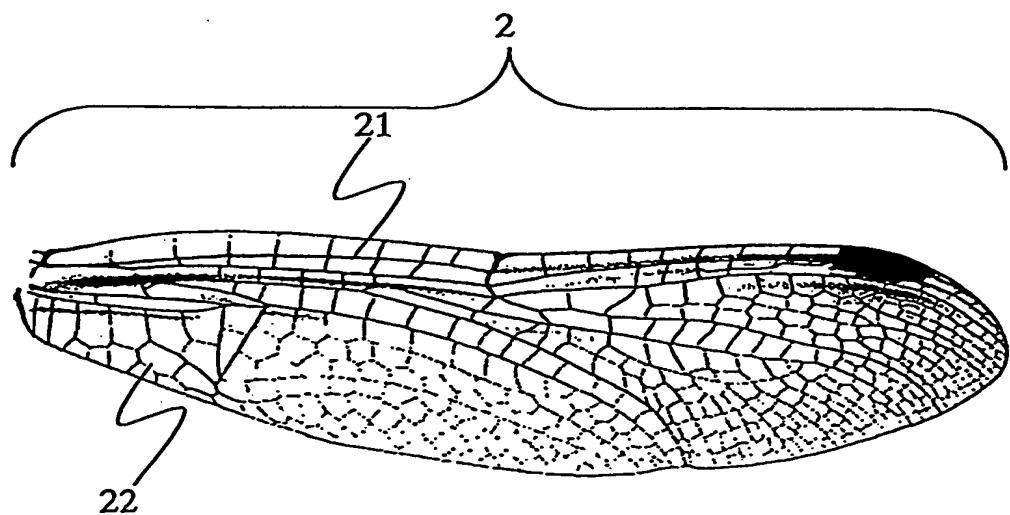


FIG.27

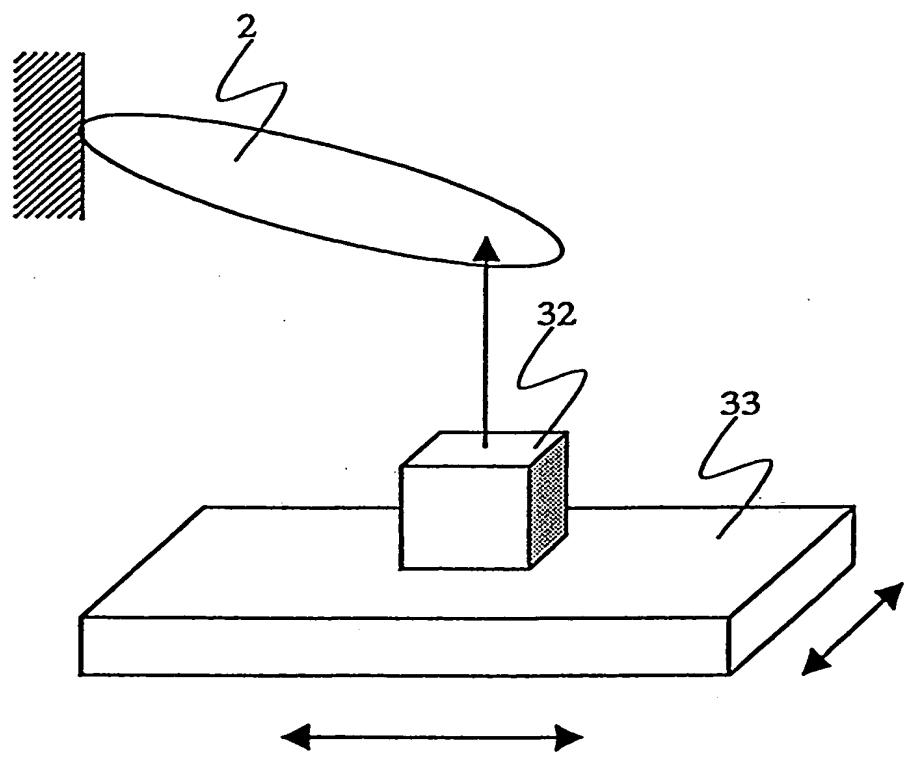
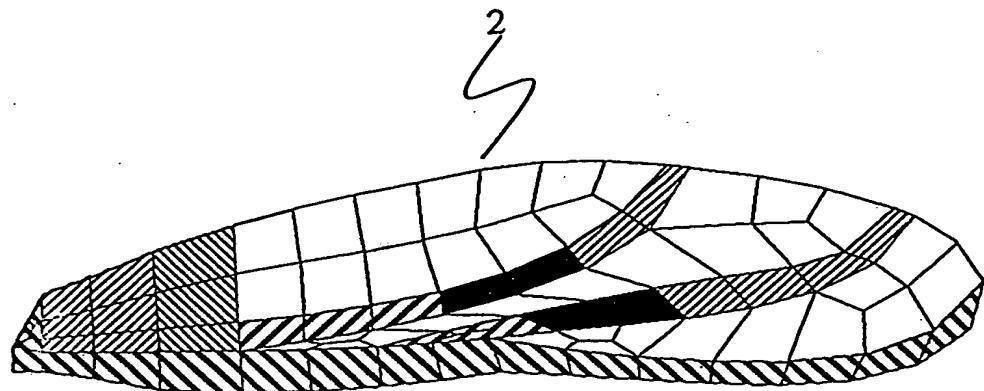


FIG.28



■ 0.35 mm

■ 0.18 mm

■ 0.15 mm

■ 0.12 mm

■ 0.1 mm

■ 0.05 mm

FIG.29

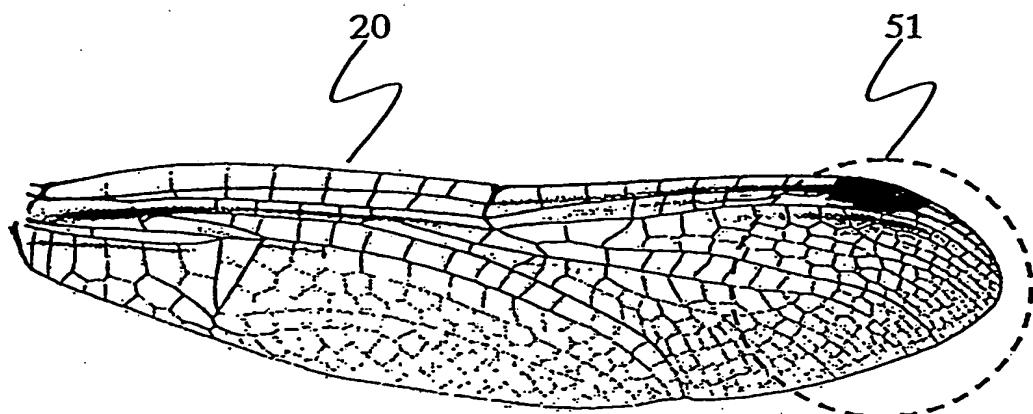


FIG.30

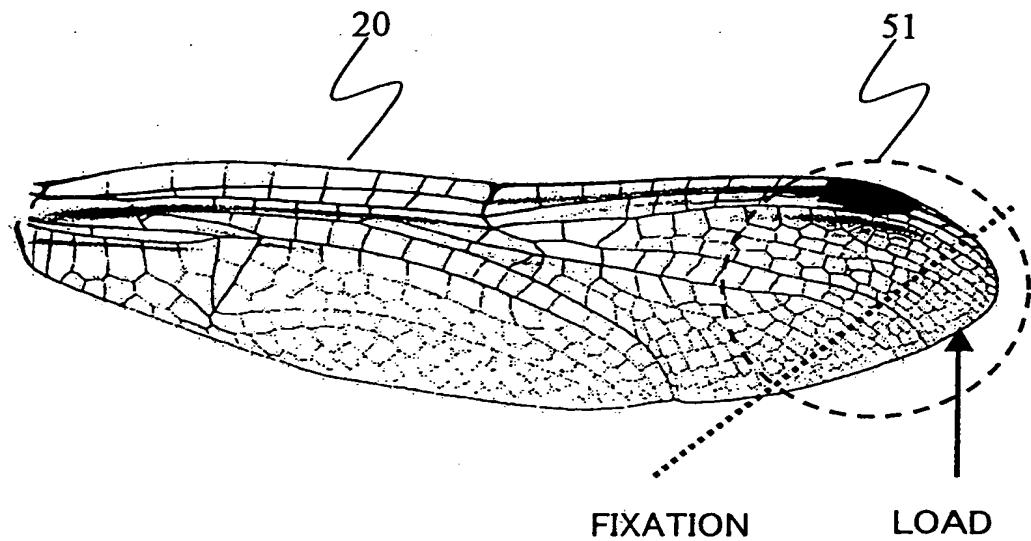


FIG.31

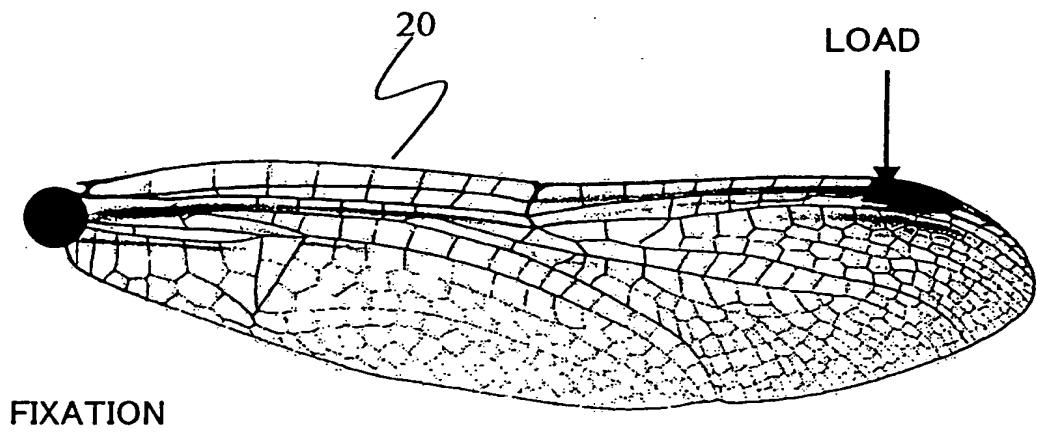


FIG.32

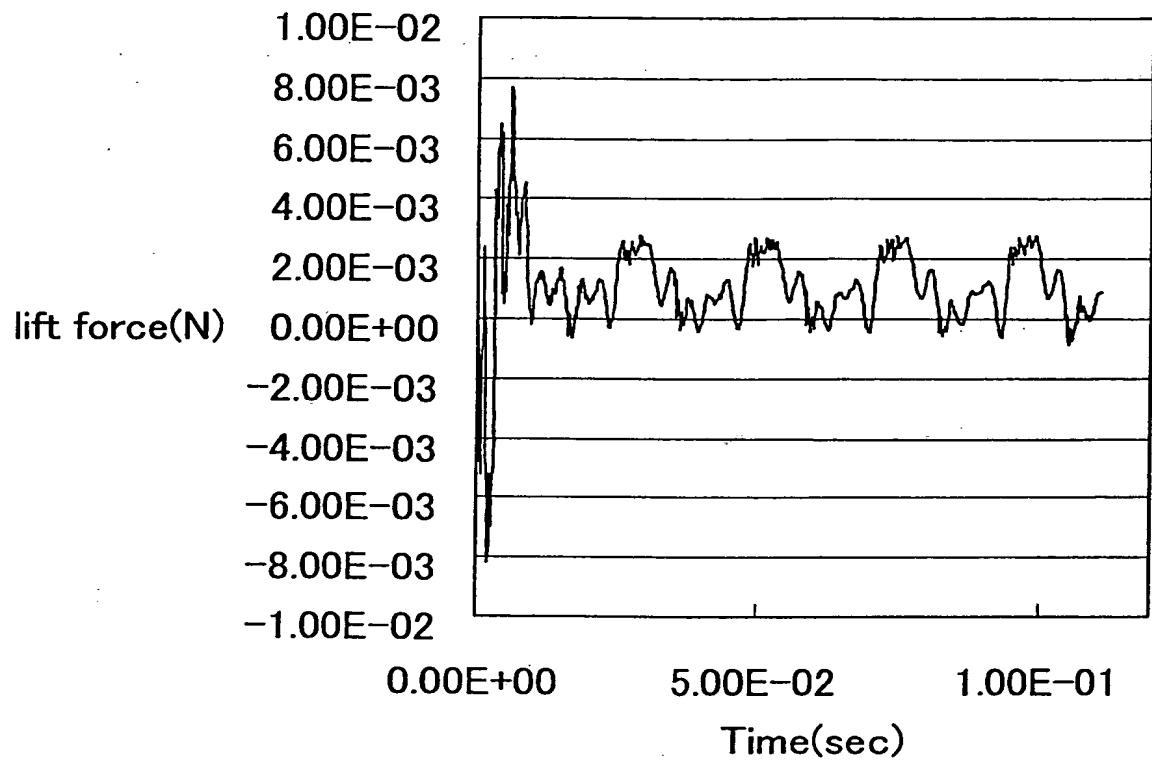


FIG.33

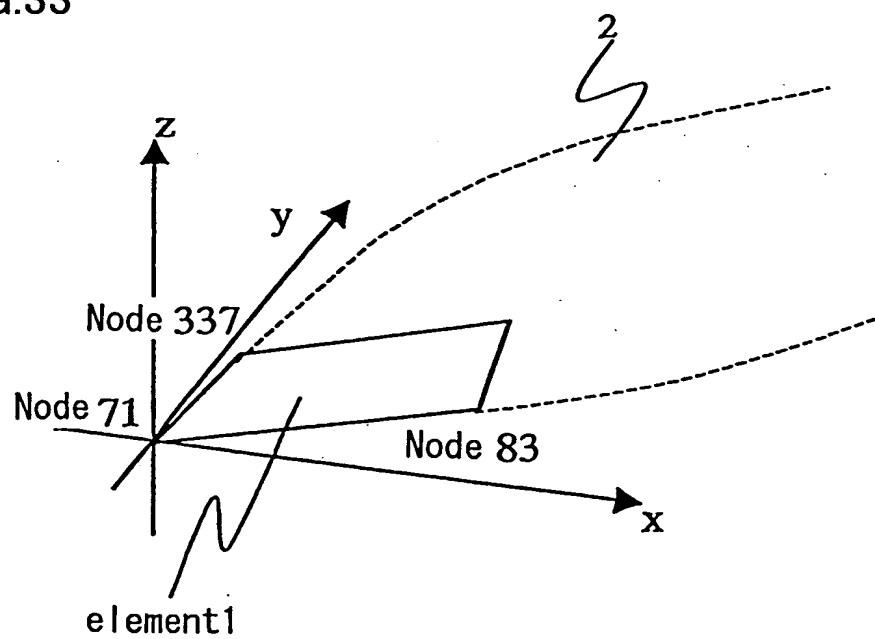


FIG.34

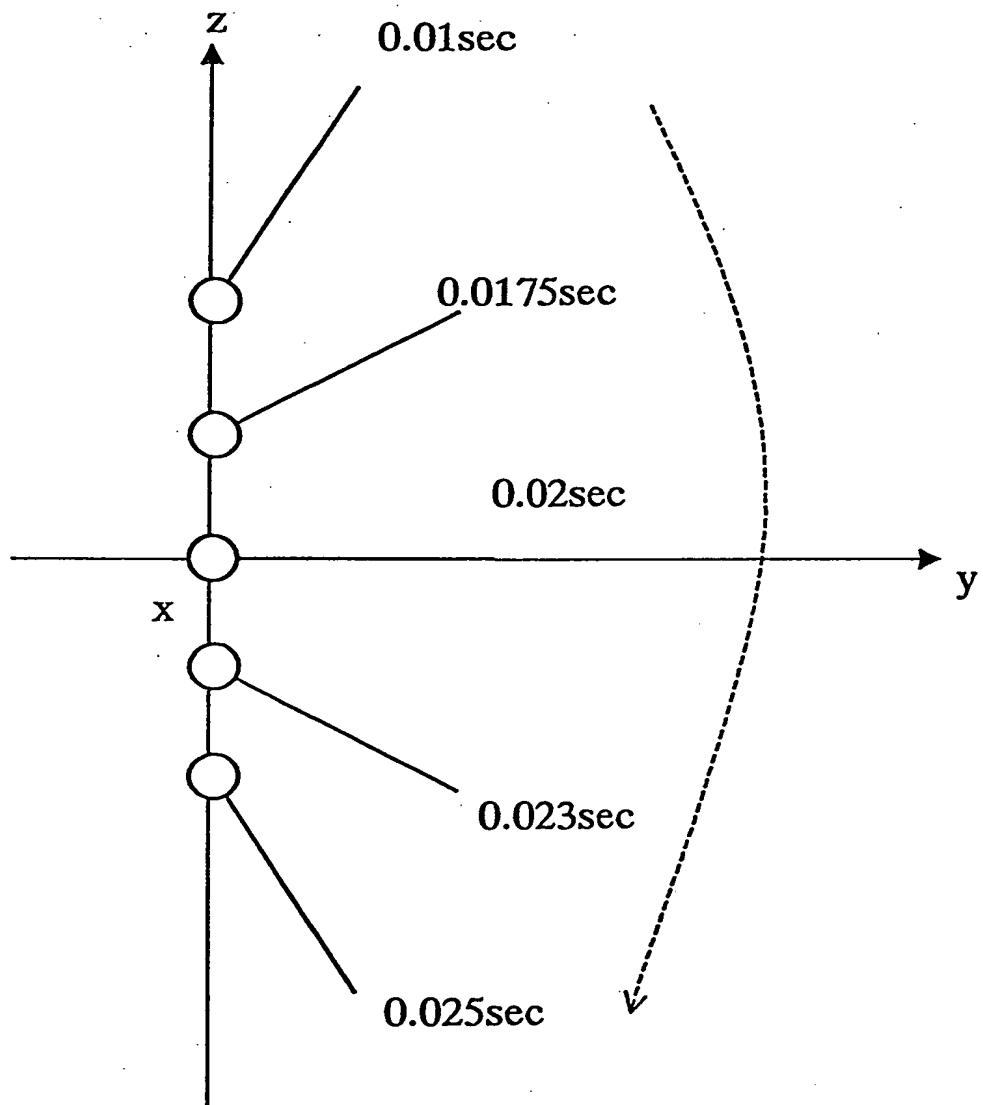


FIG.35

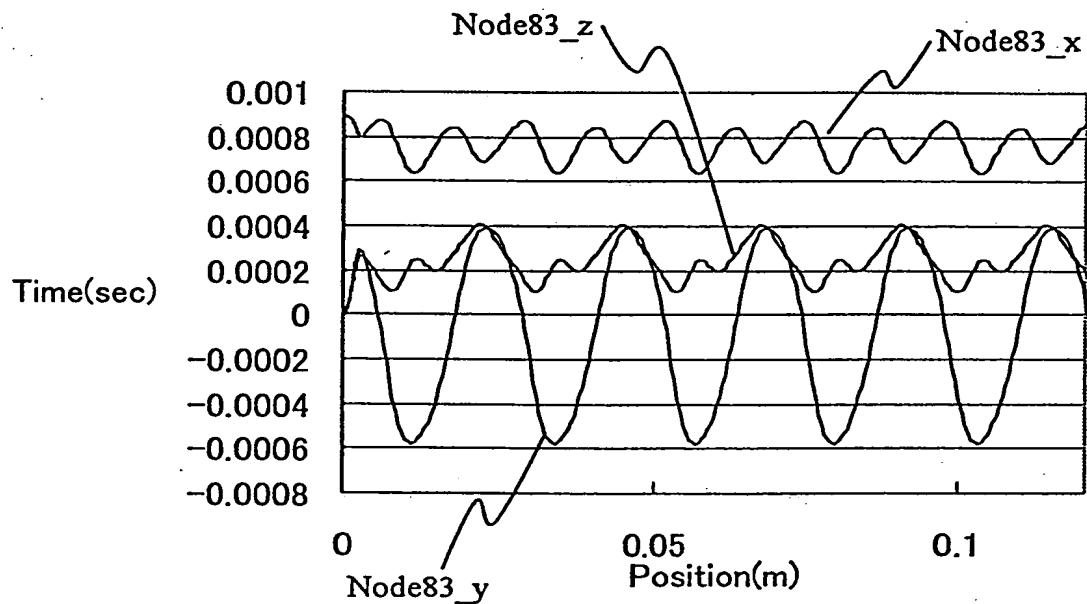


FIG.36

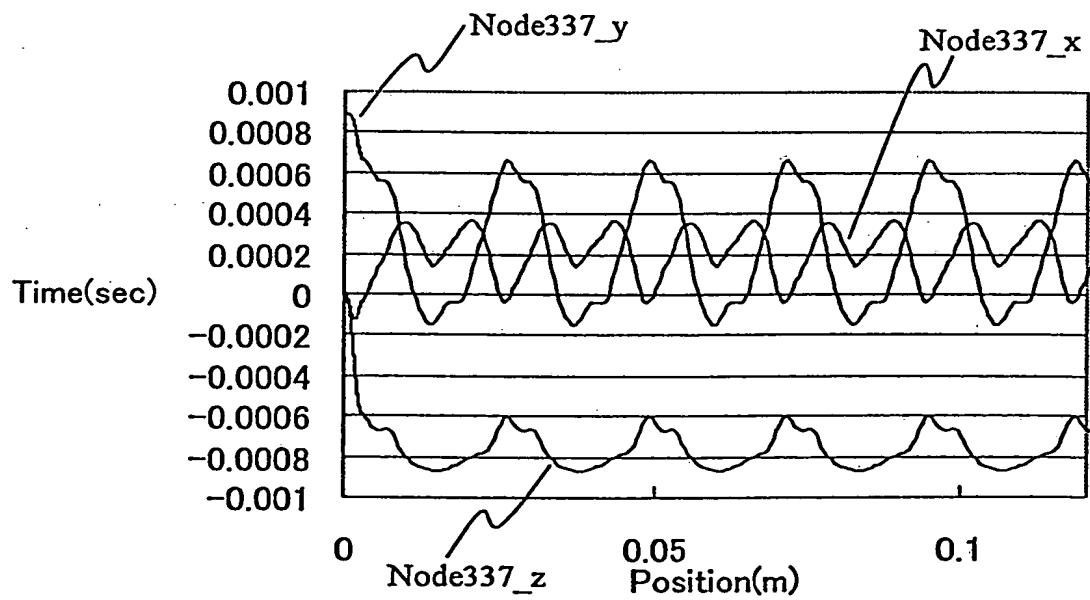


FIG.37

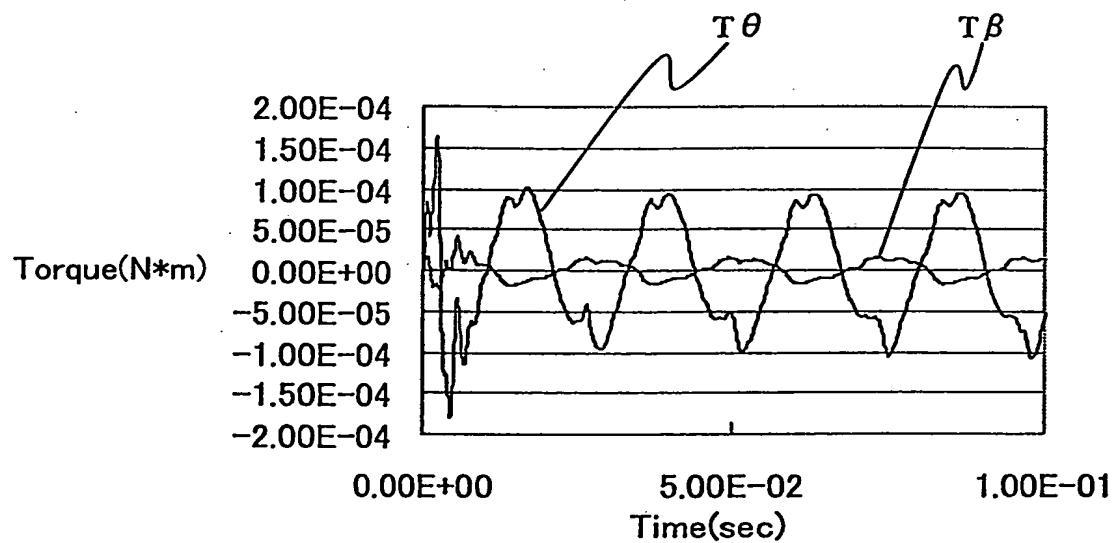
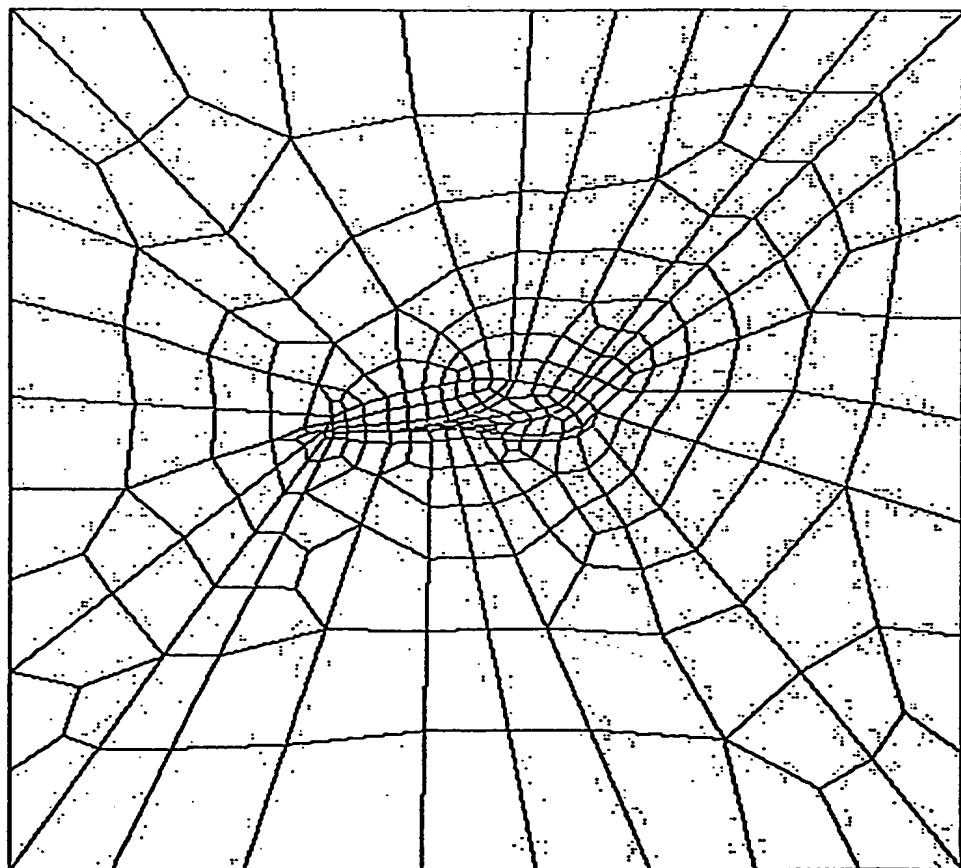


FIG.38



**FIG.39**

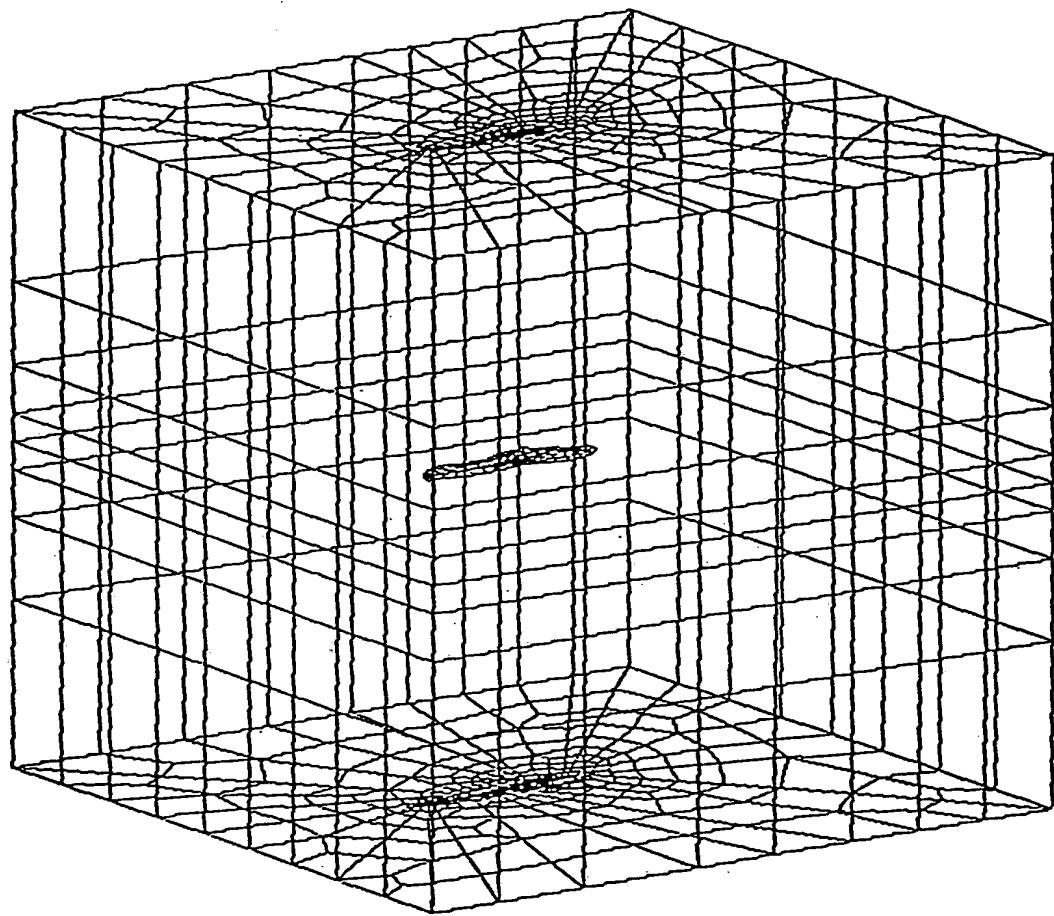


FIG.40

VERTICAL COMPONENT OF  
FULCRUM REACTION(N)

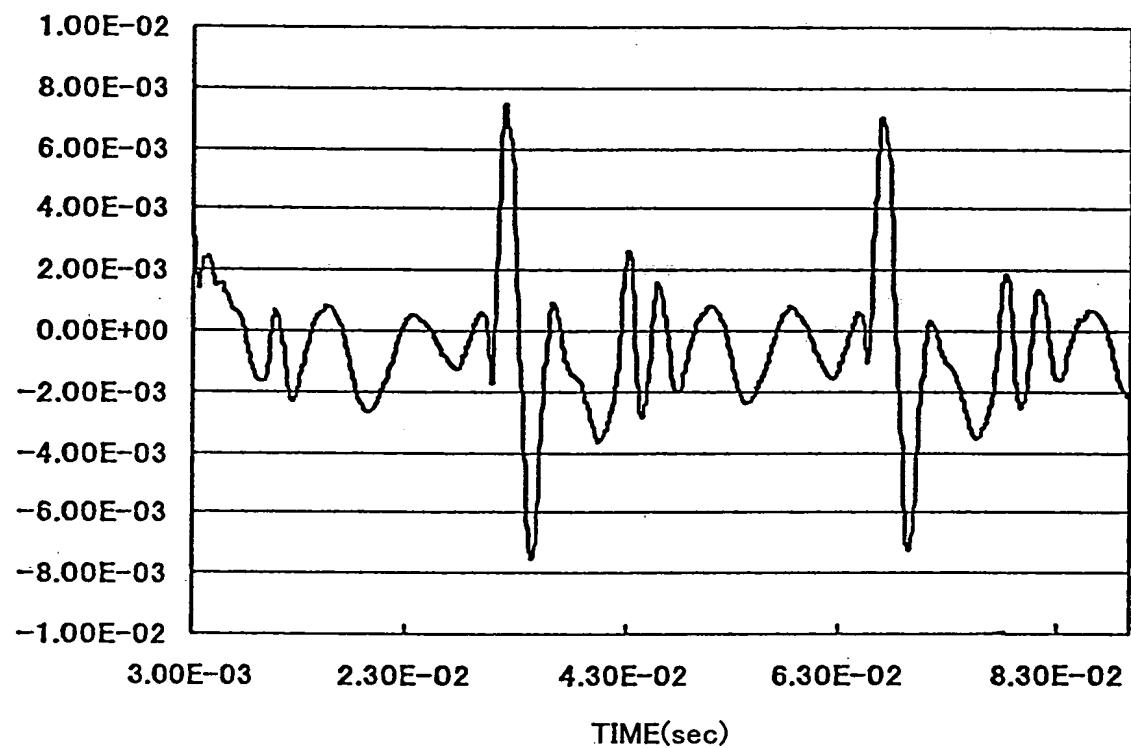


FIG.41

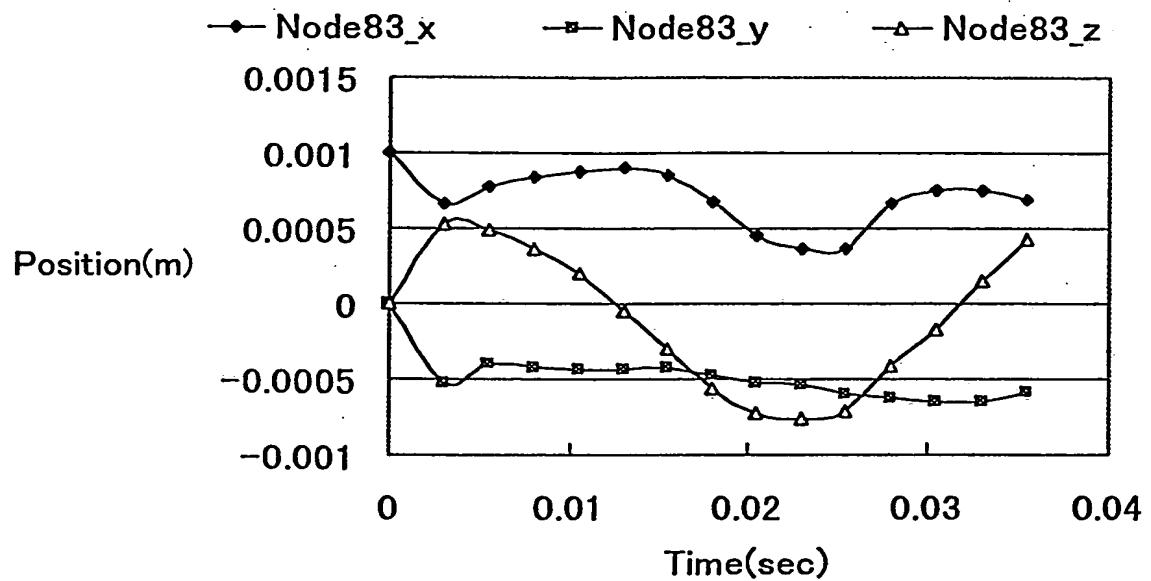


FIG.42

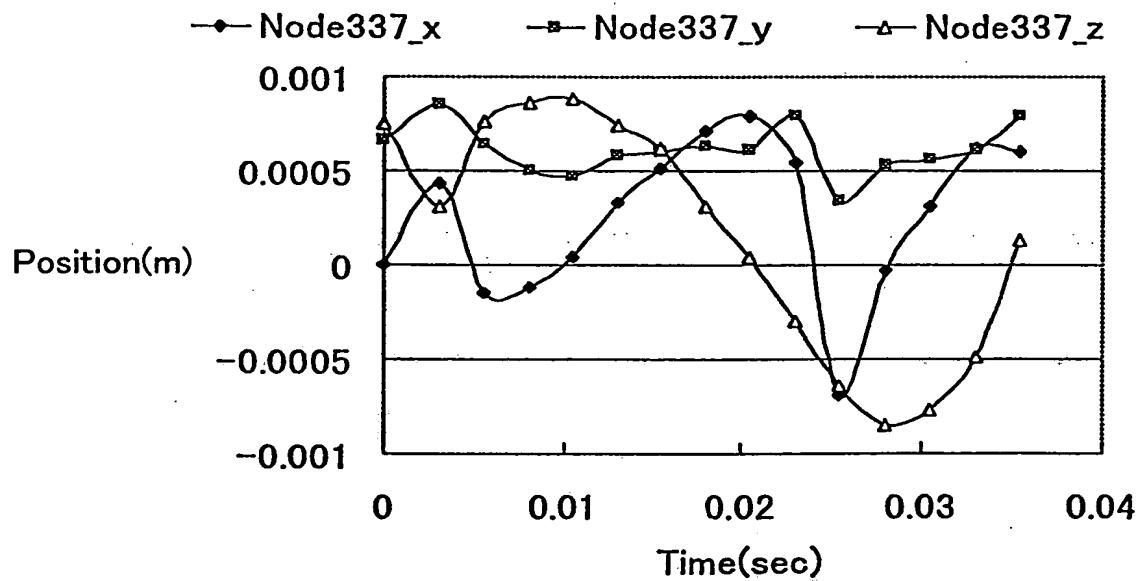


FIG.43

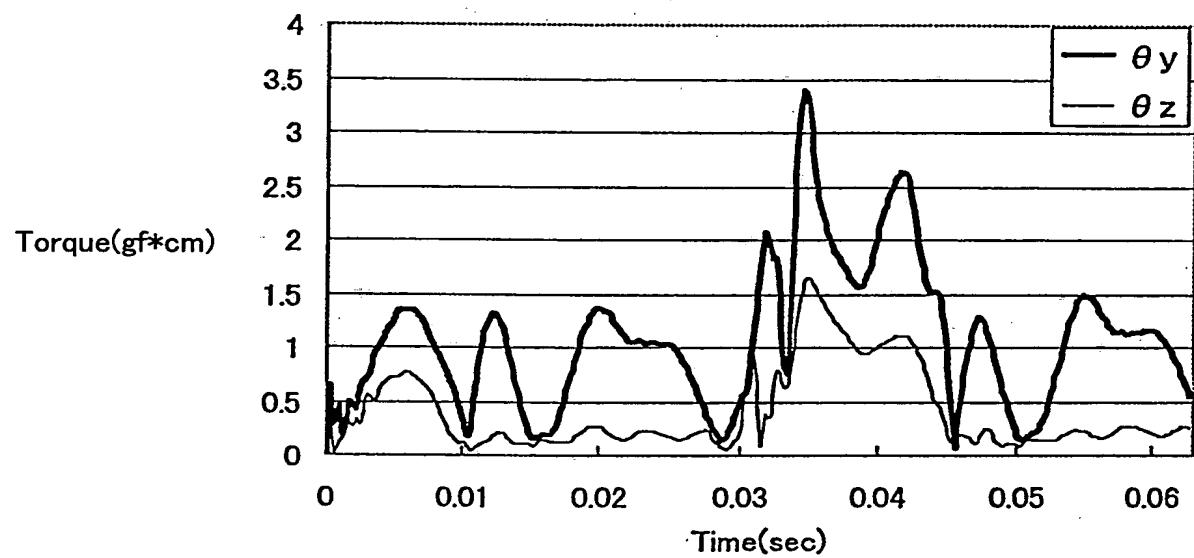


FIG.44

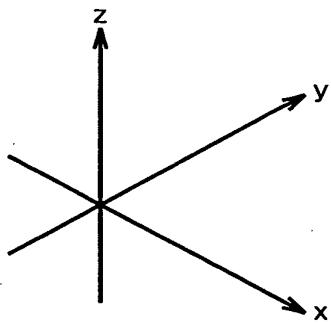
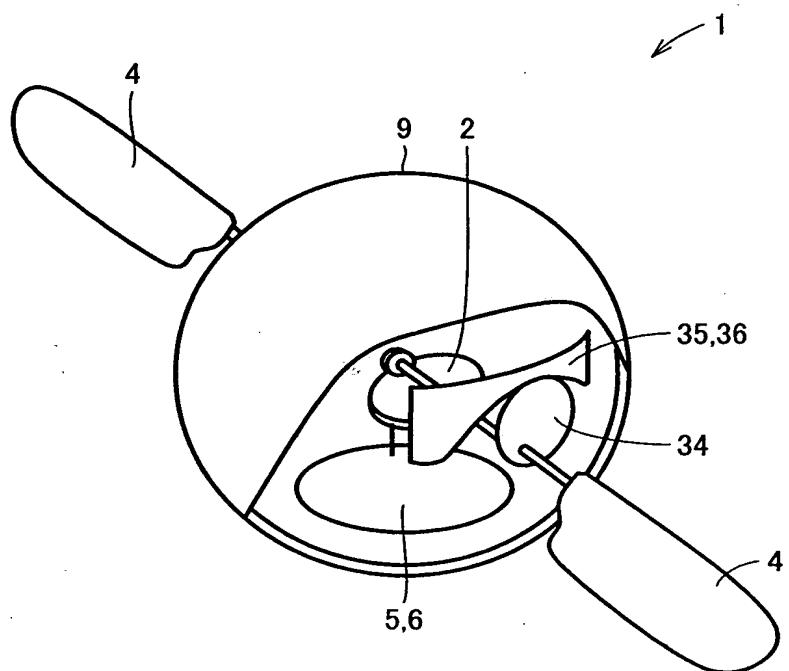


FIG.45

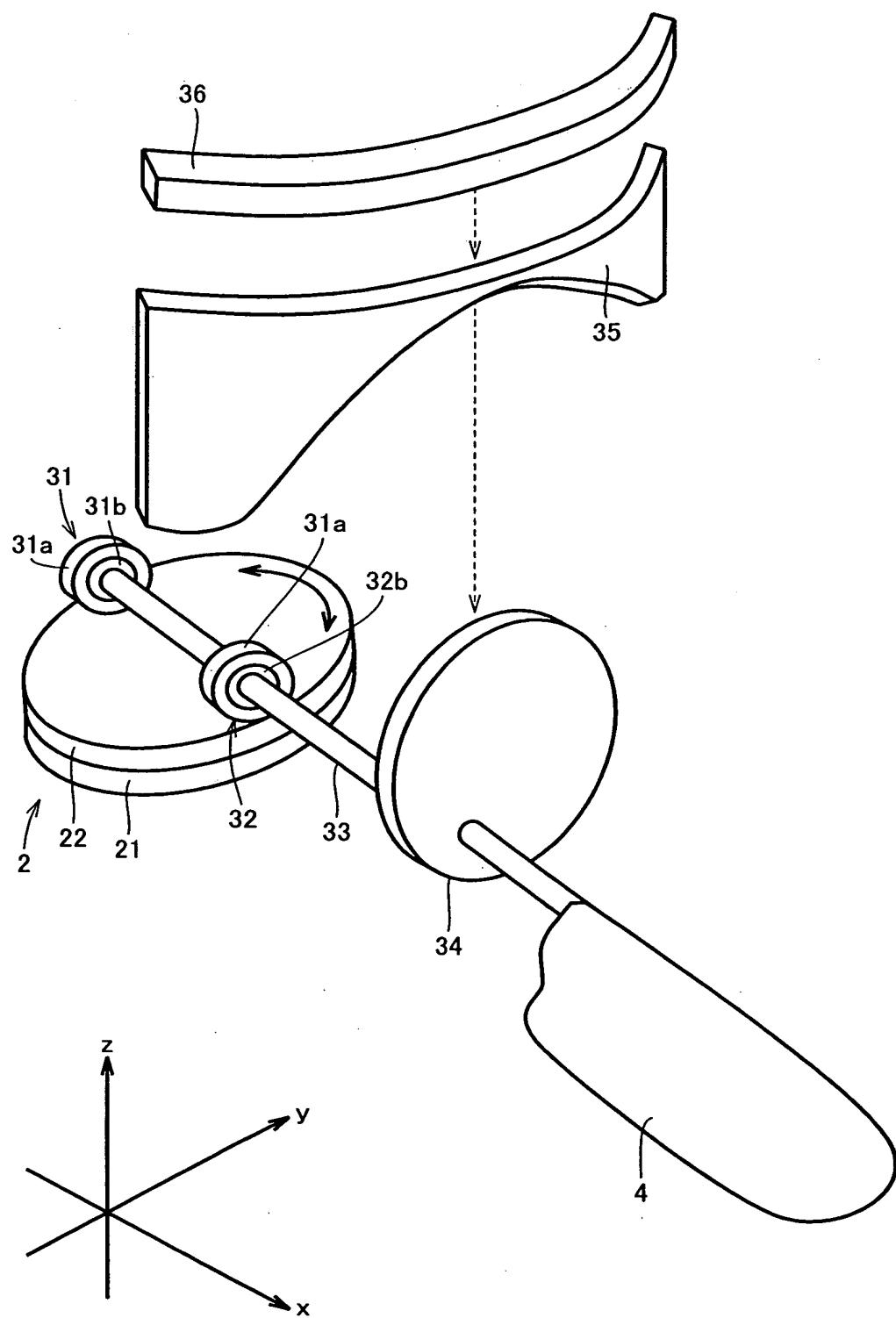


FIG.46

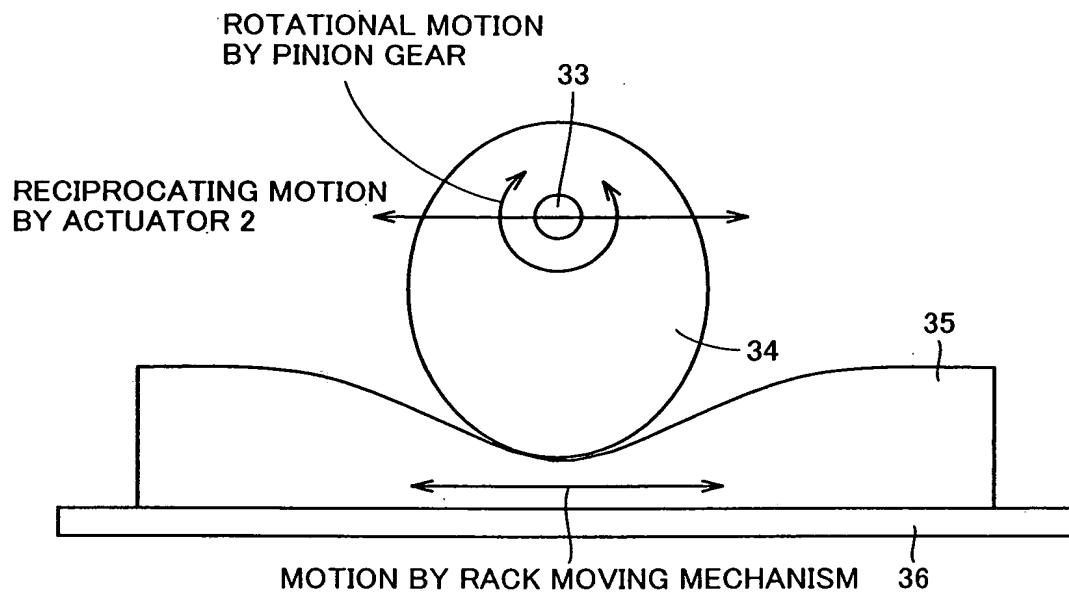


FIG.47

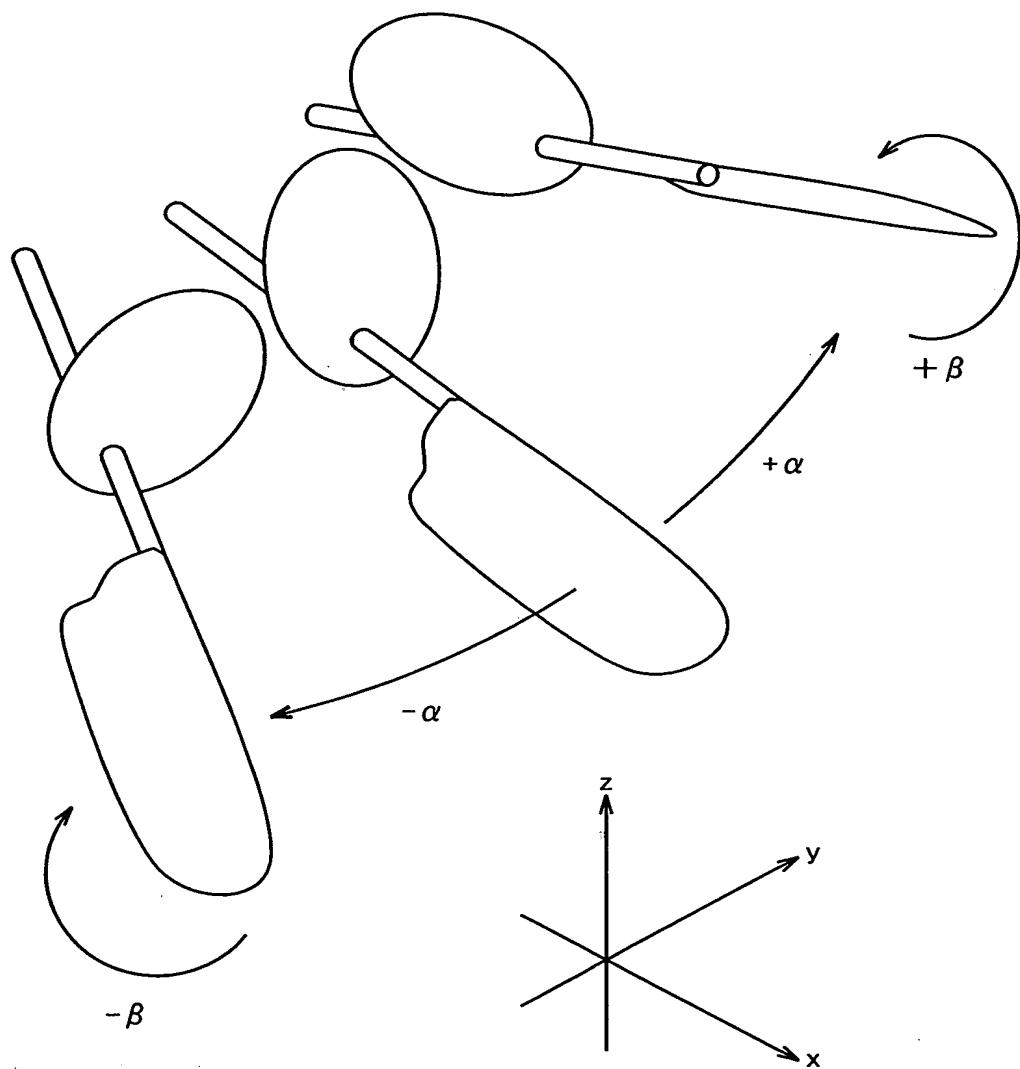


FIG.48

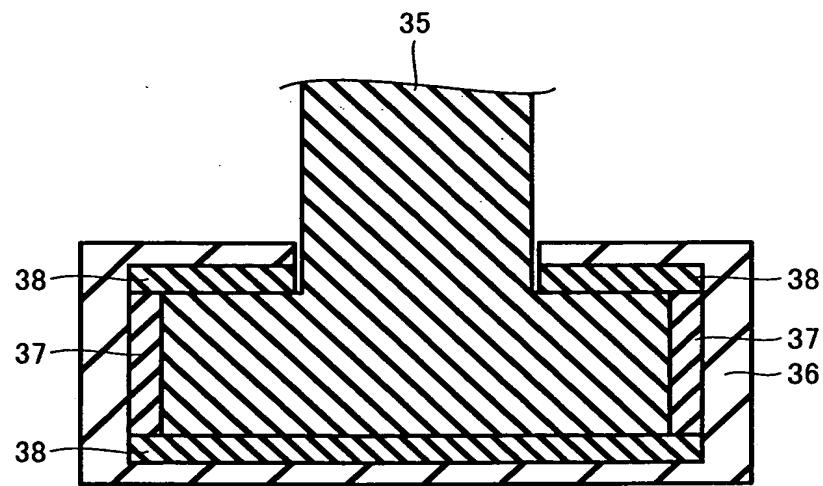
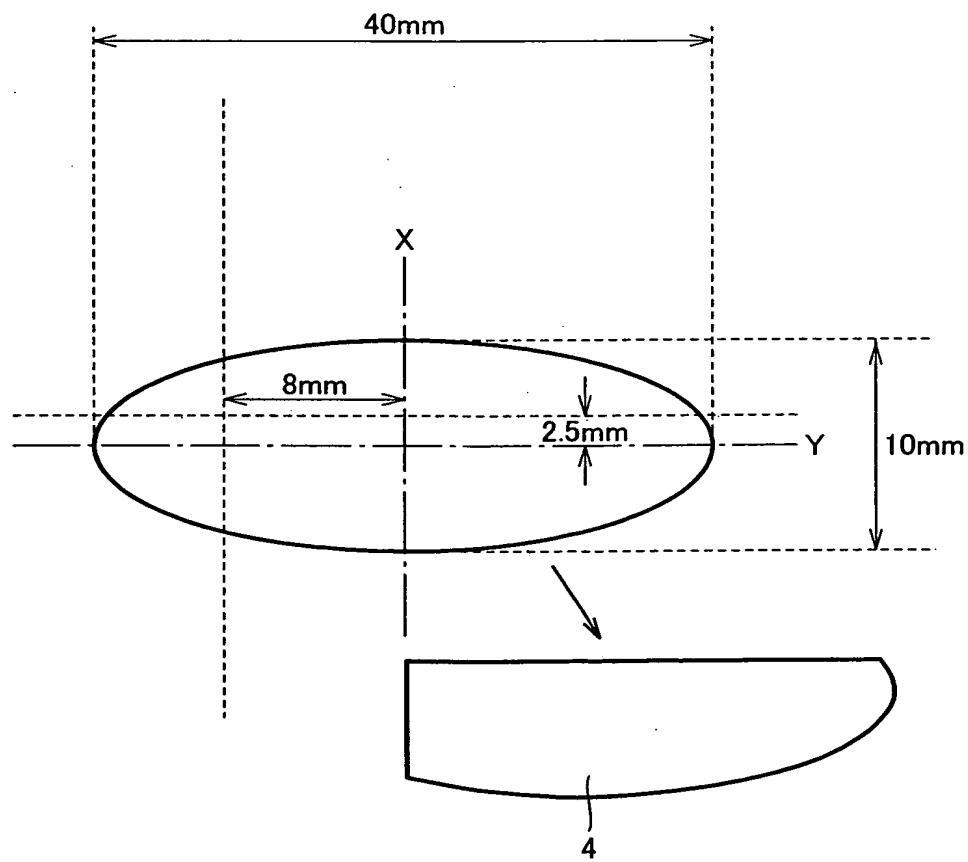
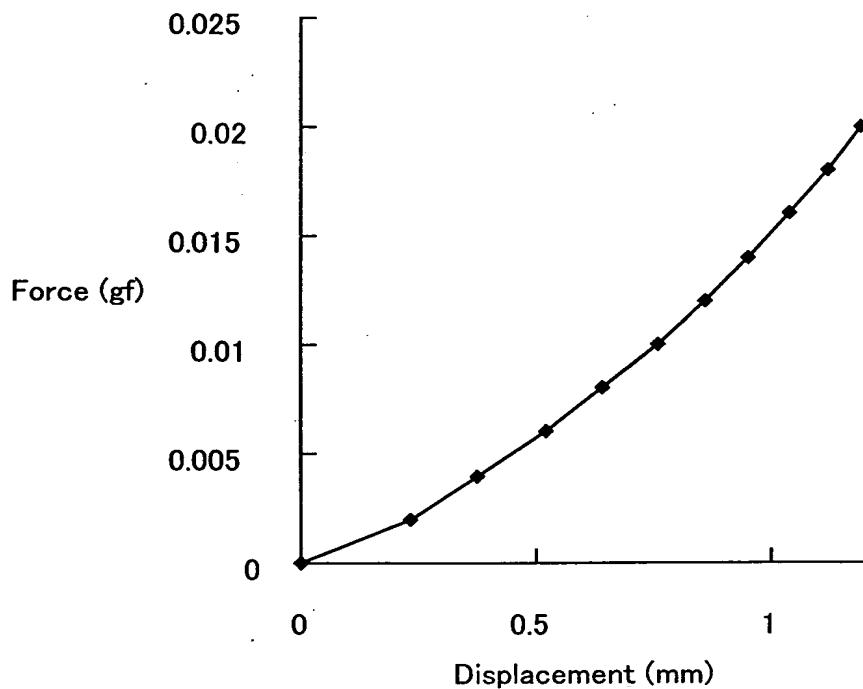


FIG.49



**FIG.50**



**FIG.51**

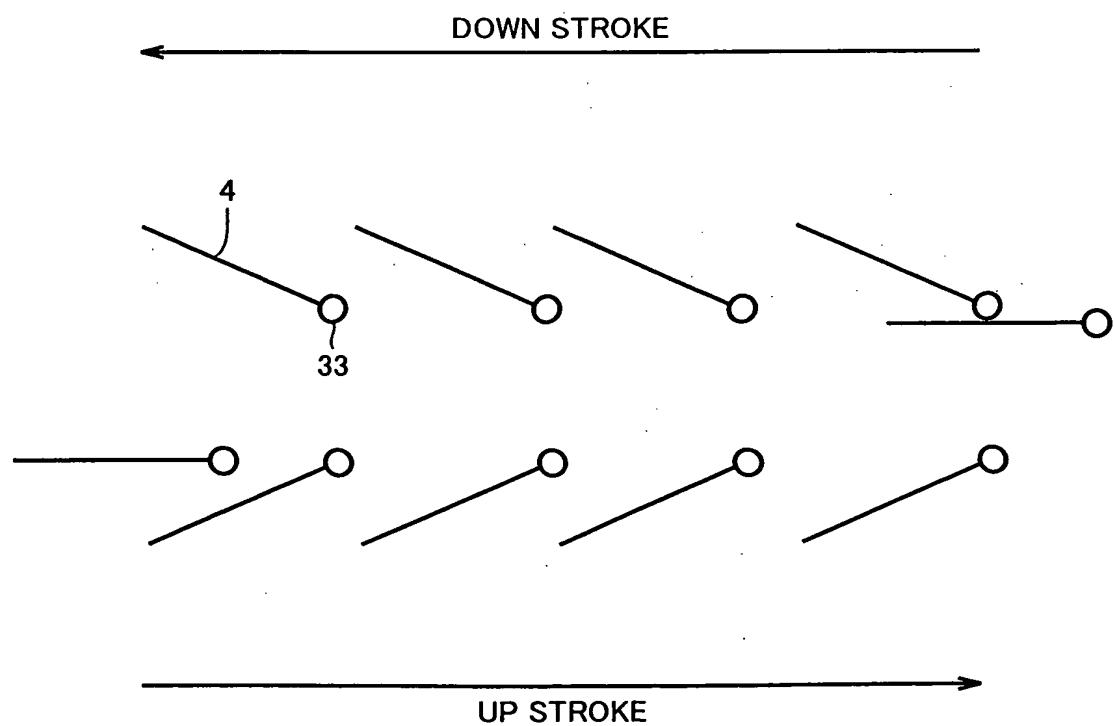


FIG.52

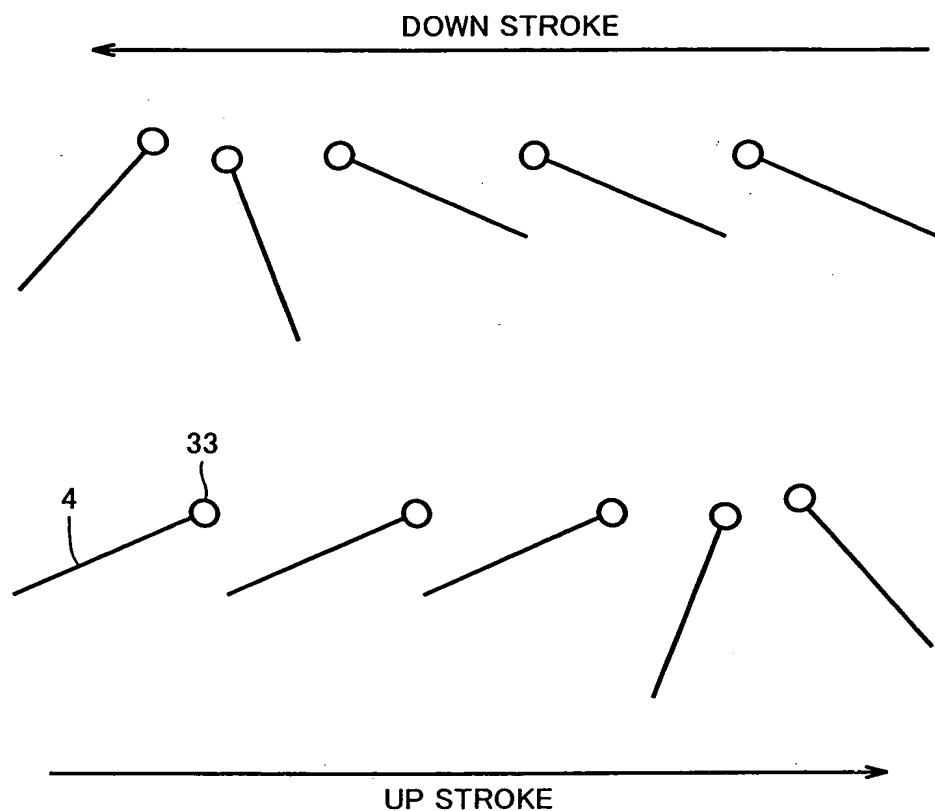


FIG.53

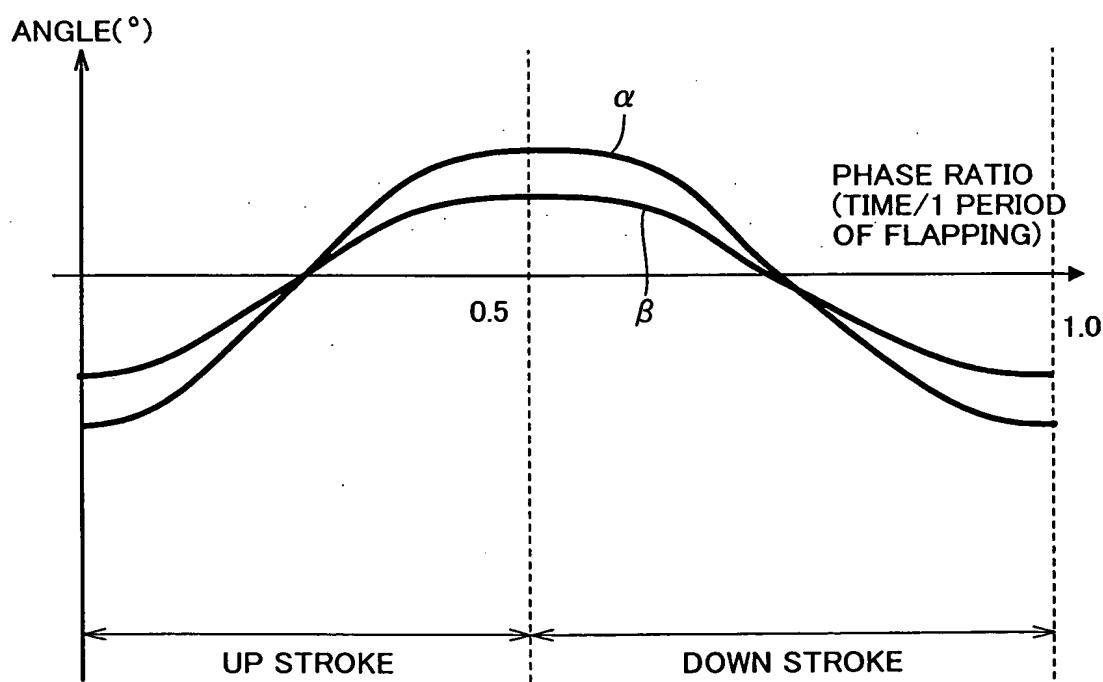


FIG.54

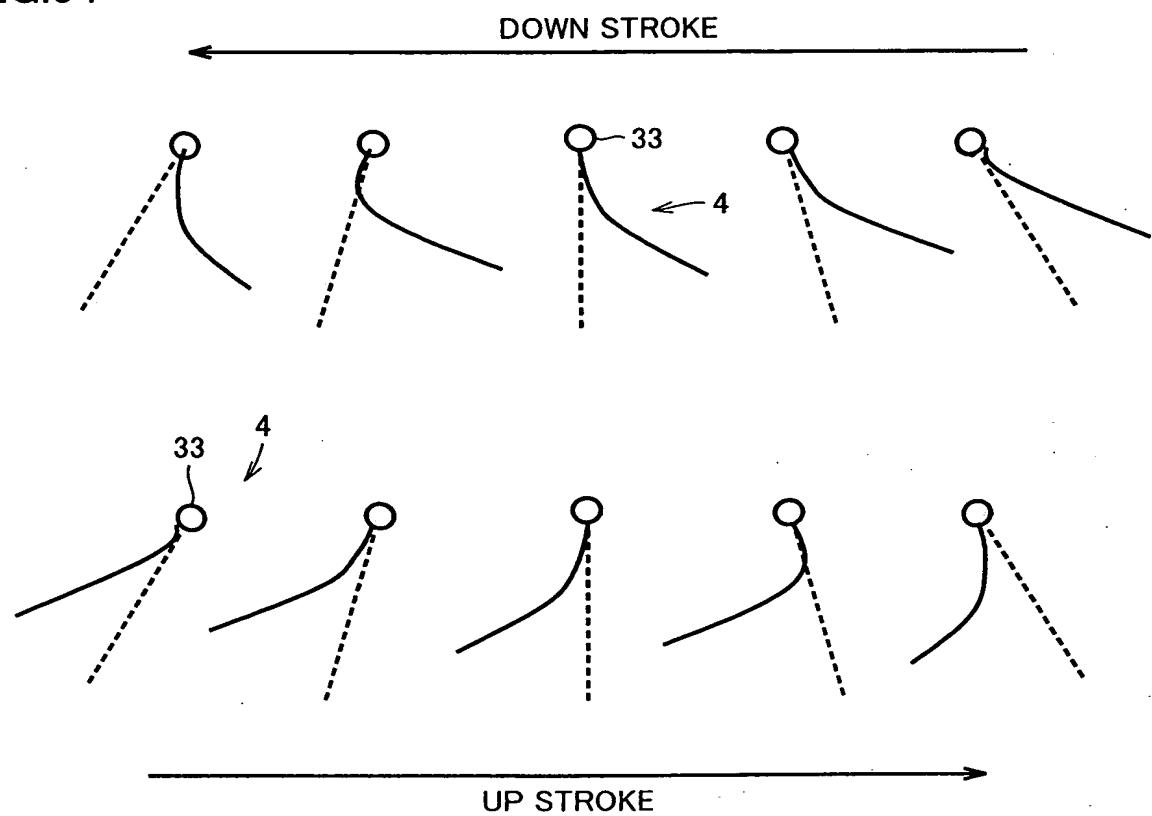


FIG.55

RECIPROCATING MOTION OF WING

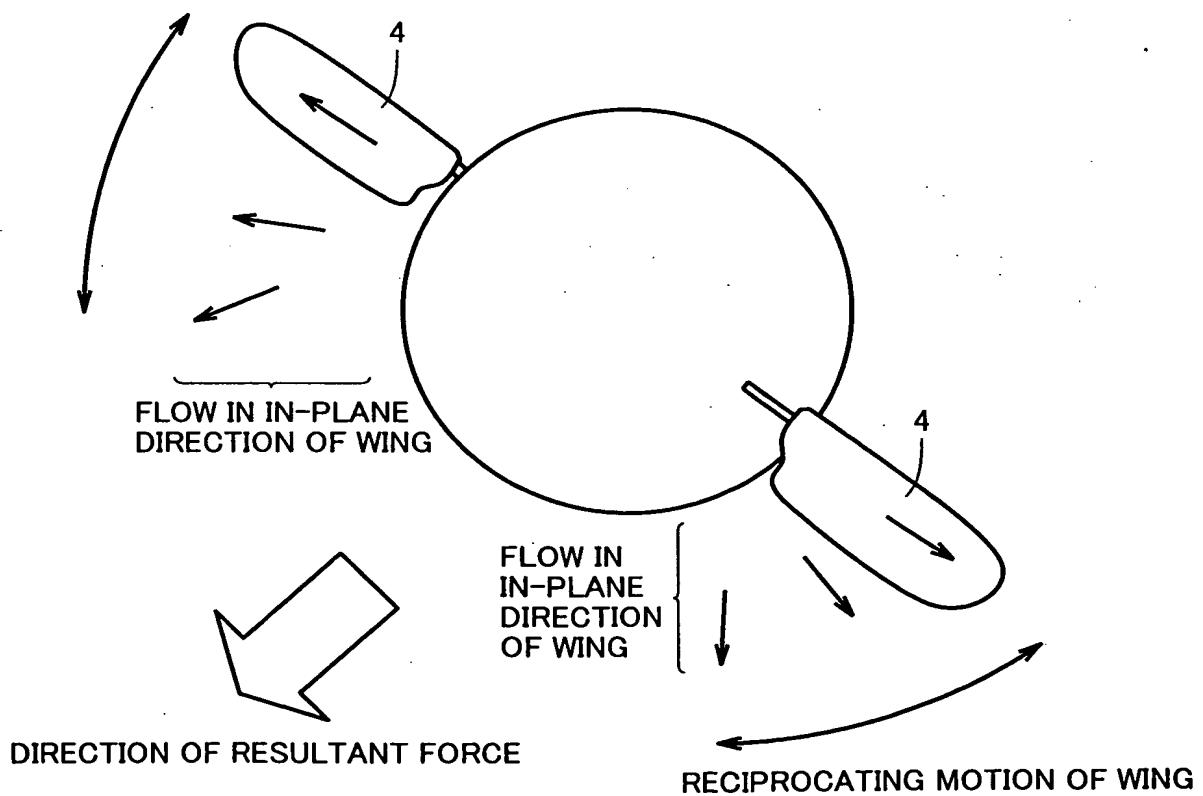


FIG.56

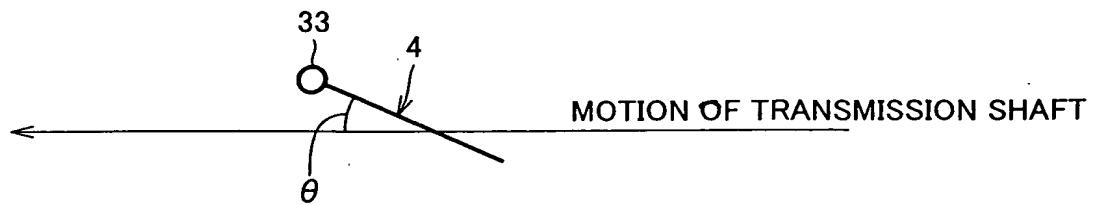


FIG57

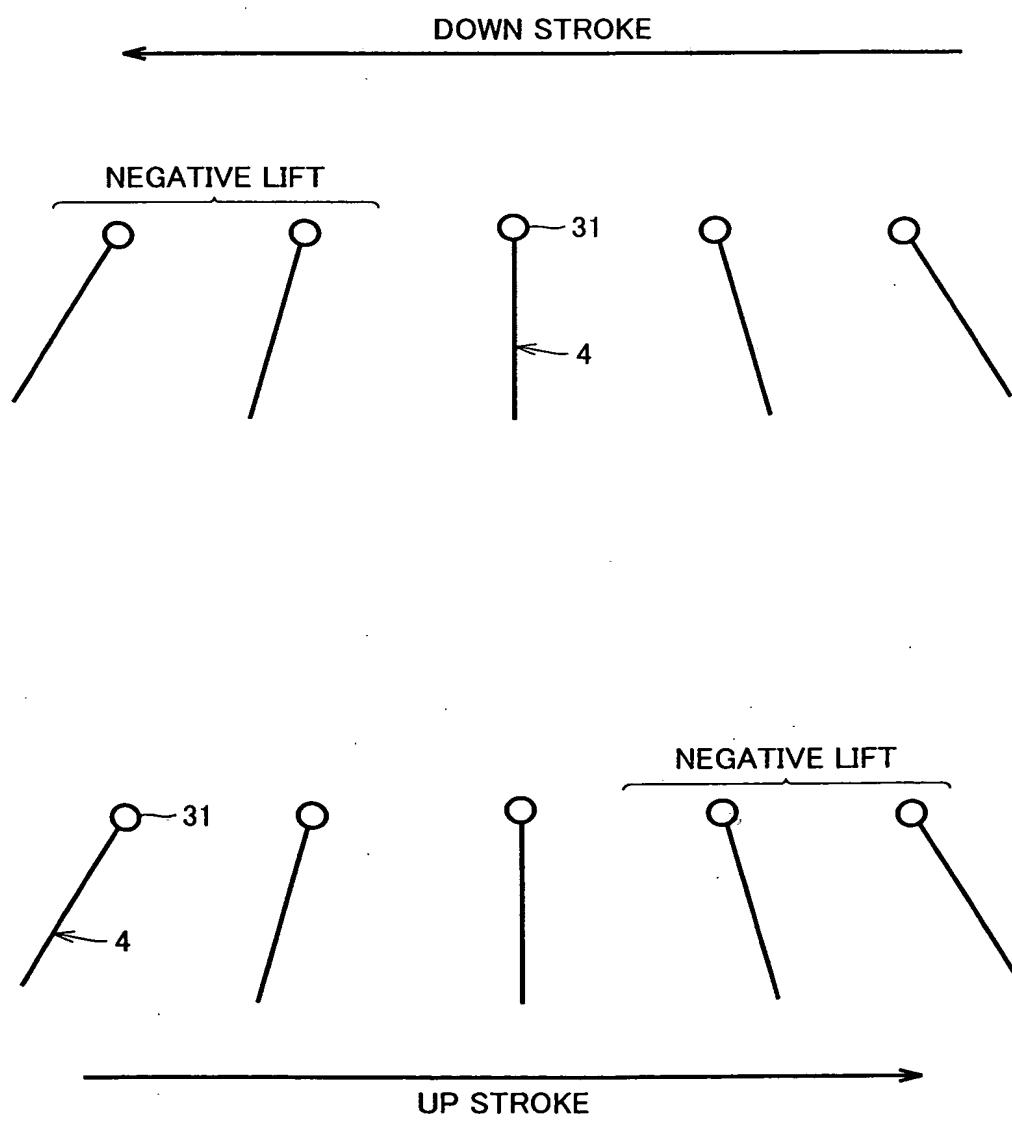
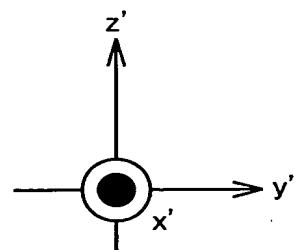
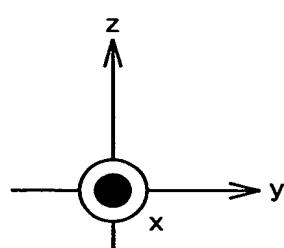
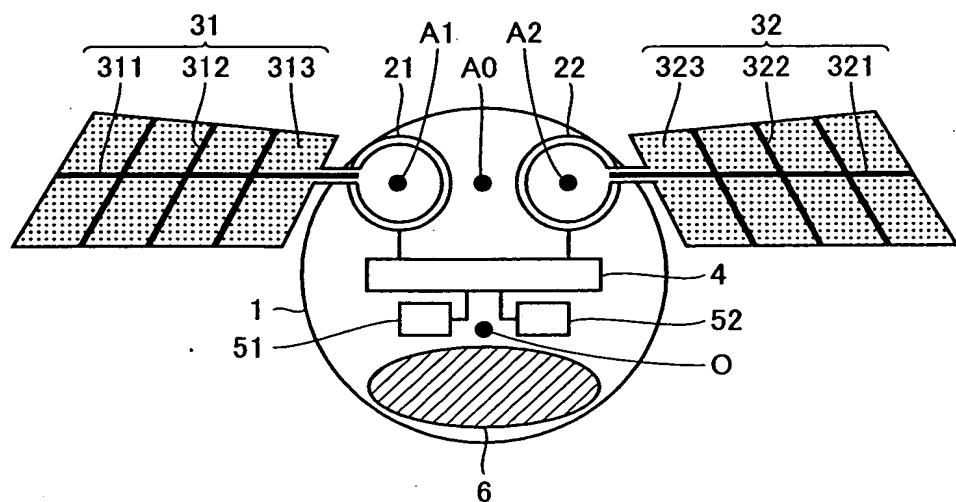
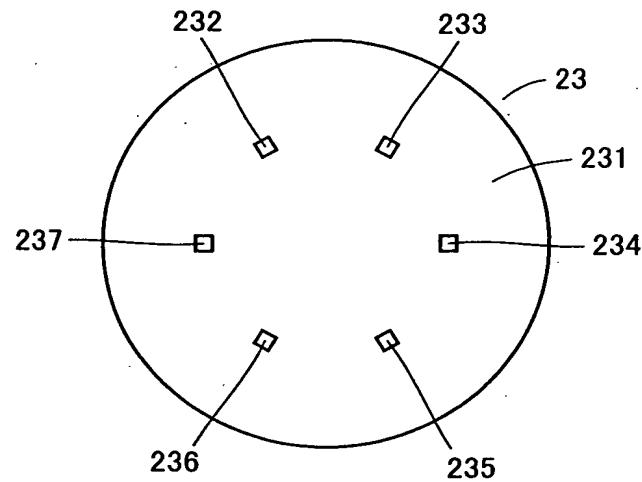


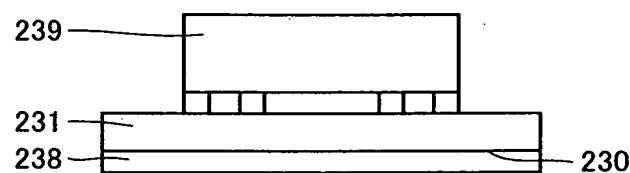
FIG.58



**FIG.59**



**FIG.60**



**FIG.61**

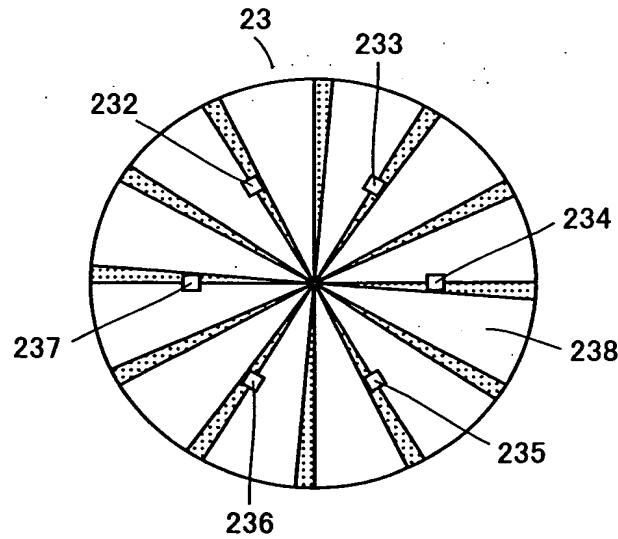


FIG.62

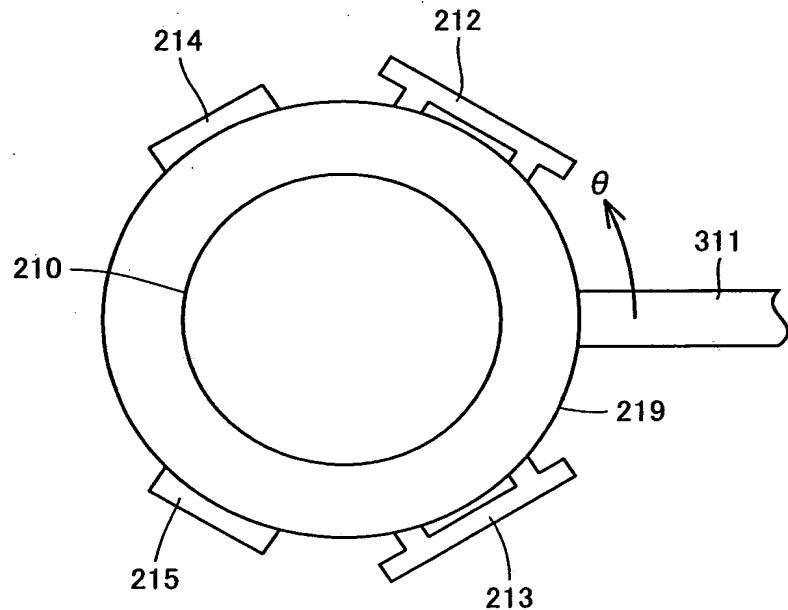


FIG.63

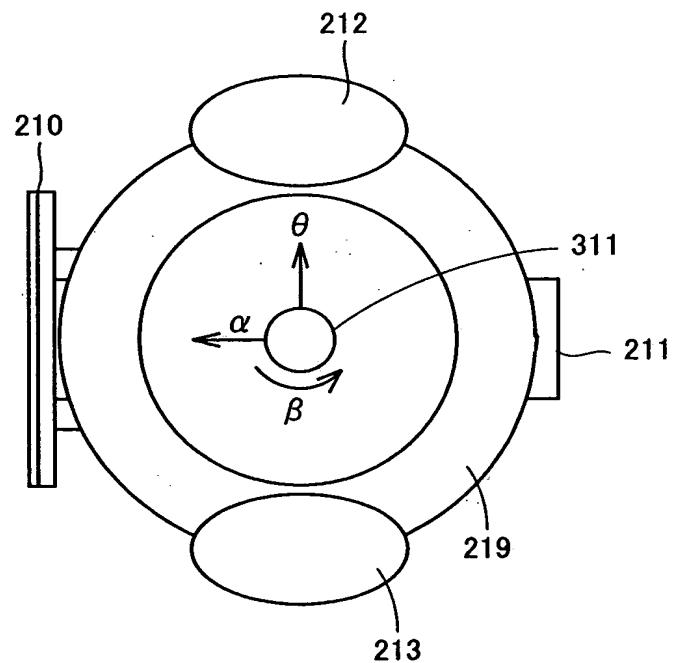


FIG.64

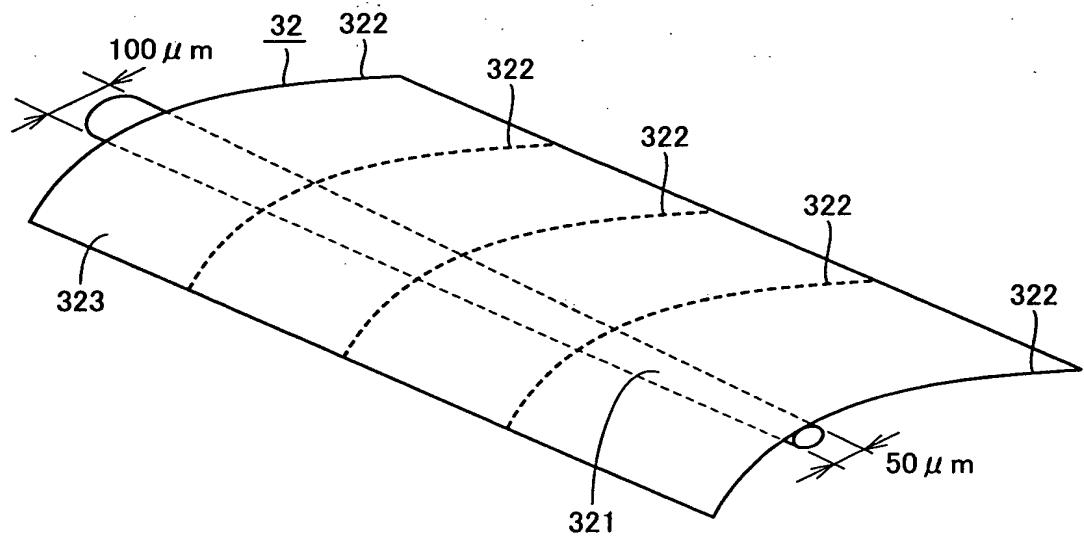


FIG.65

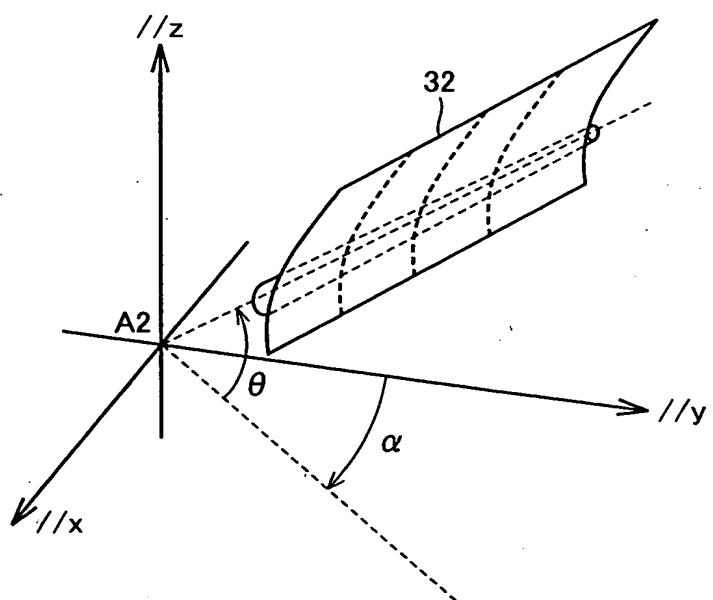


FIG.66

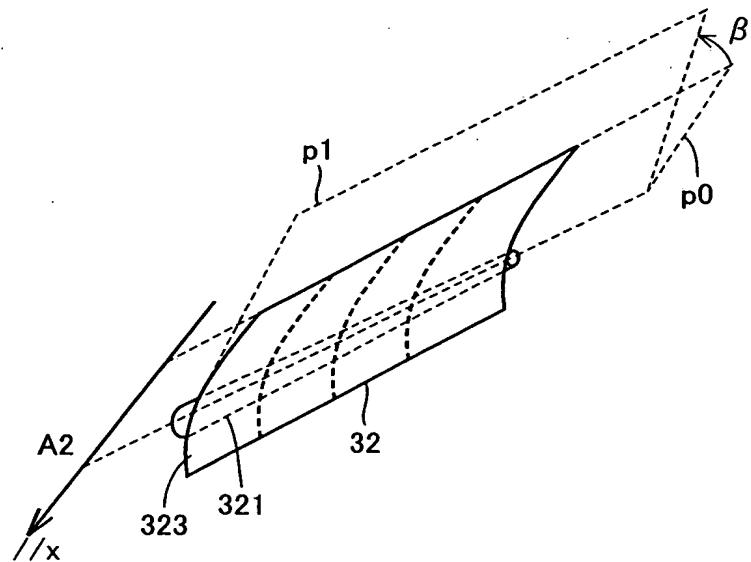


FIG.67

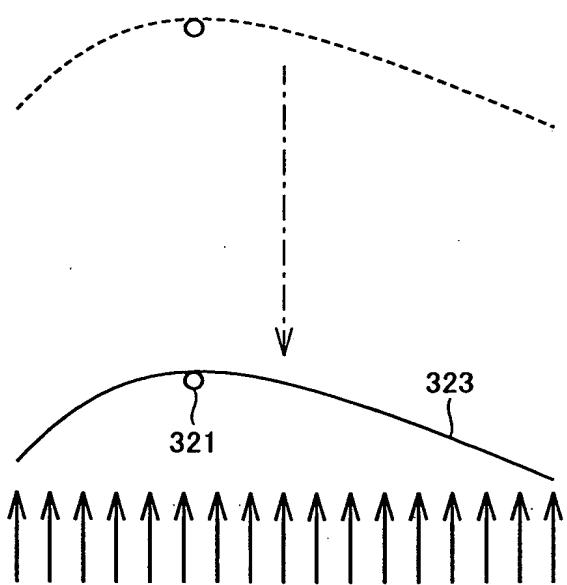


FIG.68

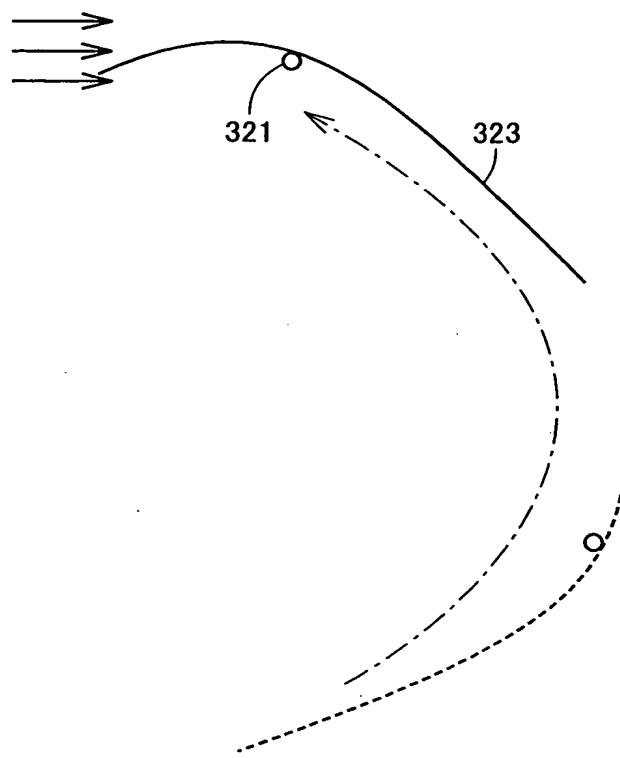


FIG.69

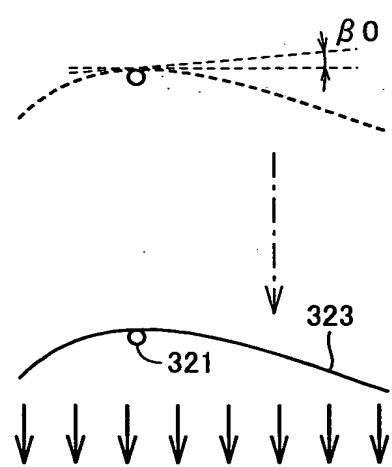


FIG.70

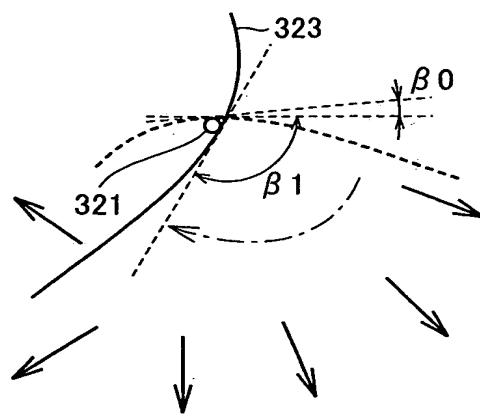


FIG.71

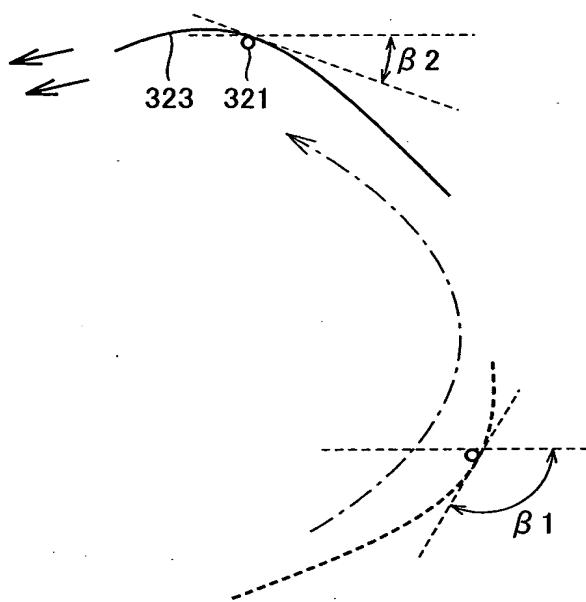


FIG.72

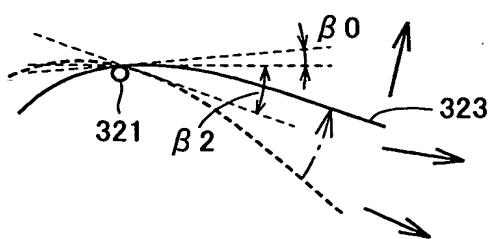


FIG.73

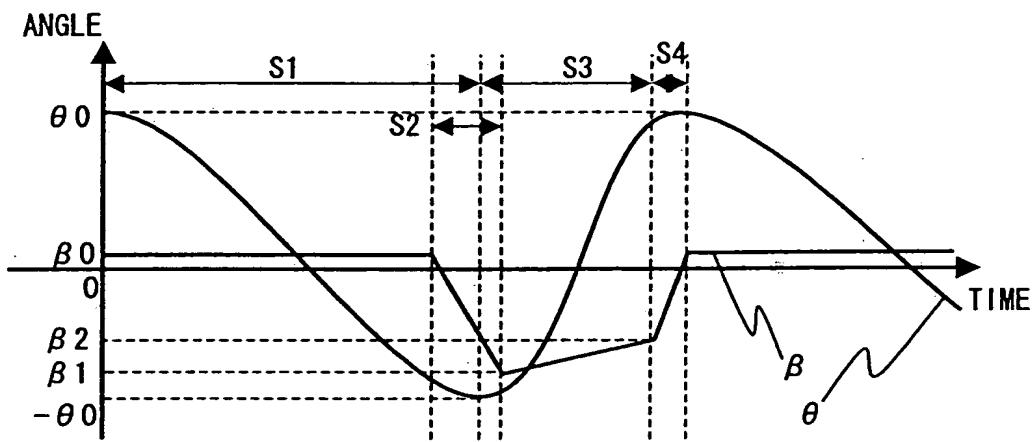


FIG.74

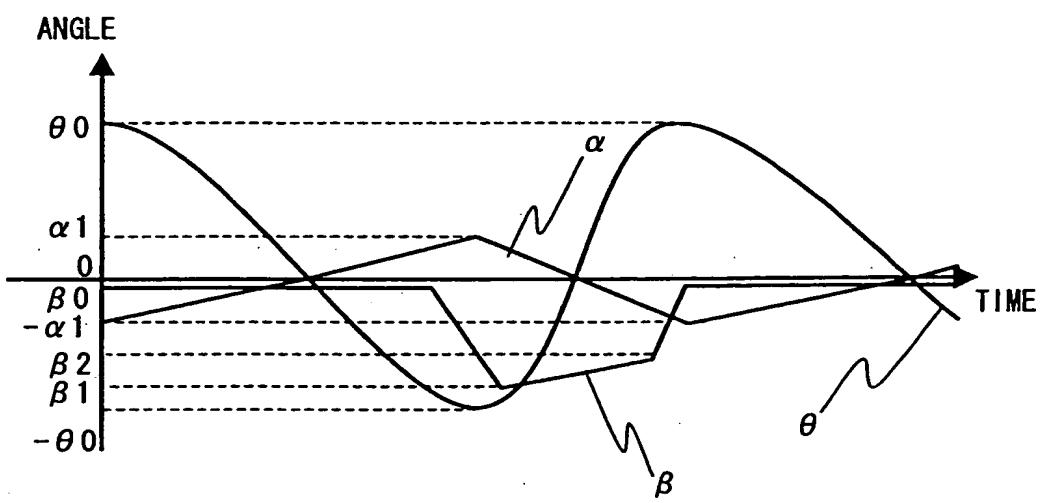


FIG.75

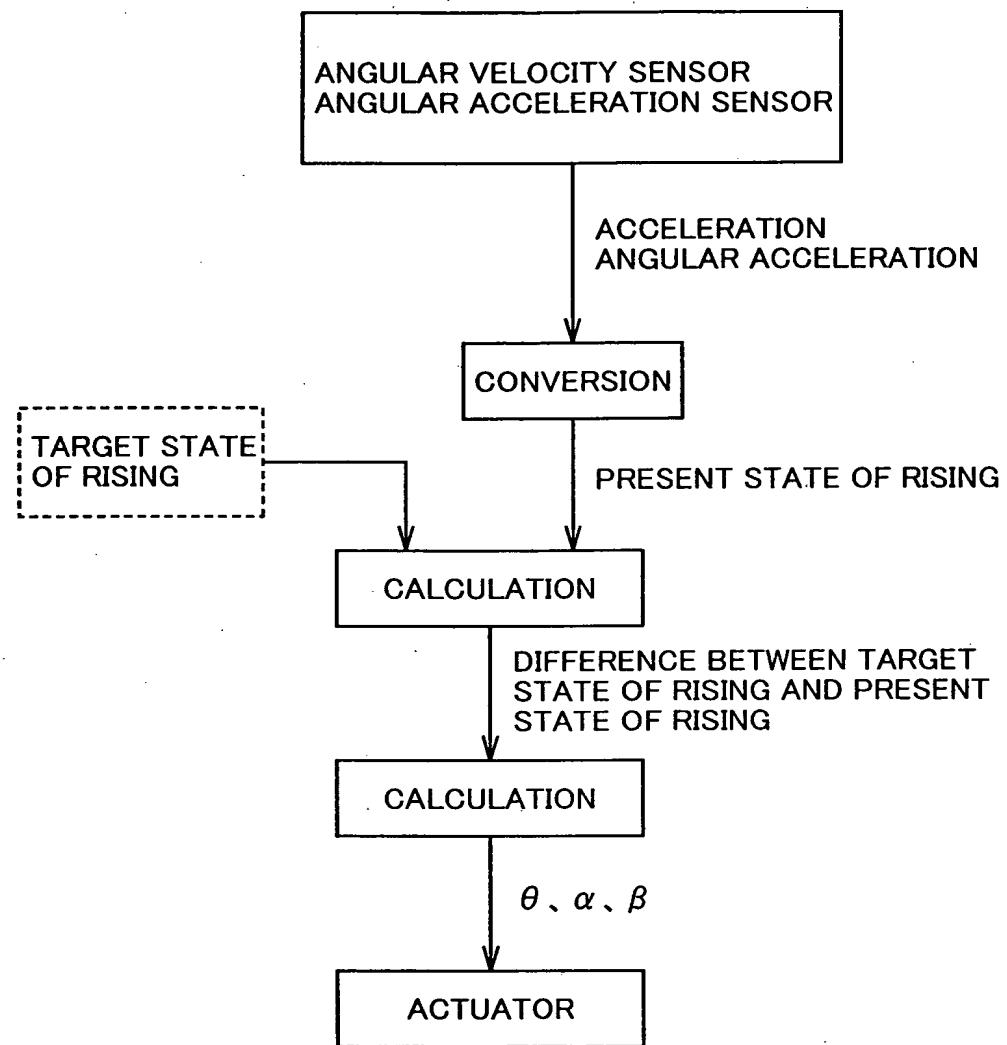


FIG.76

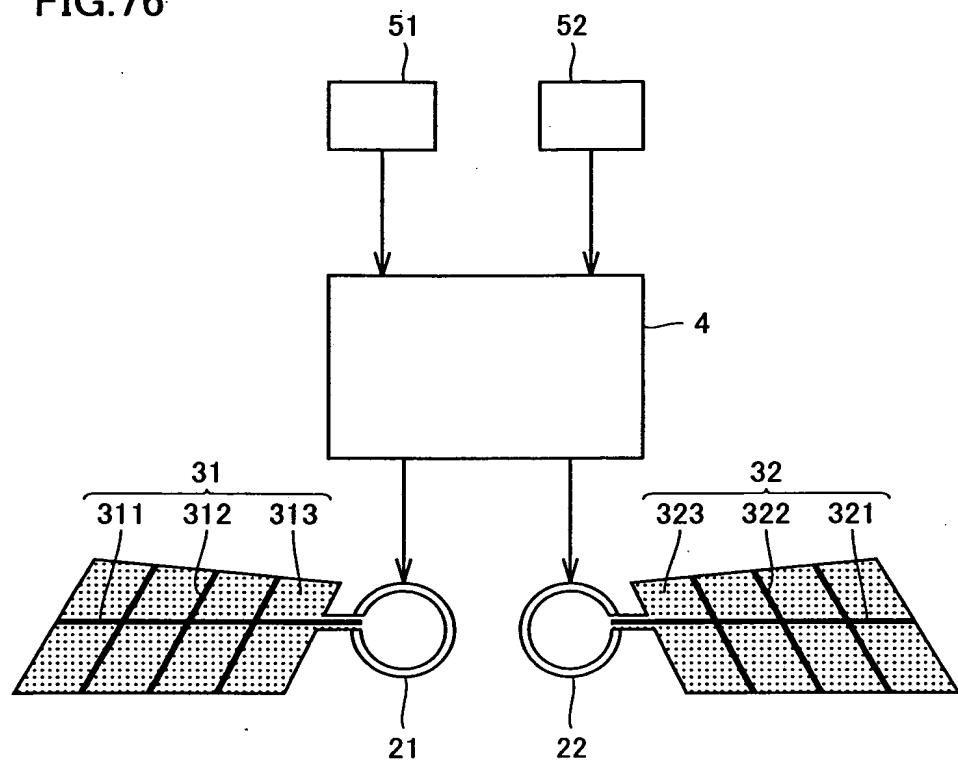


FIG.77

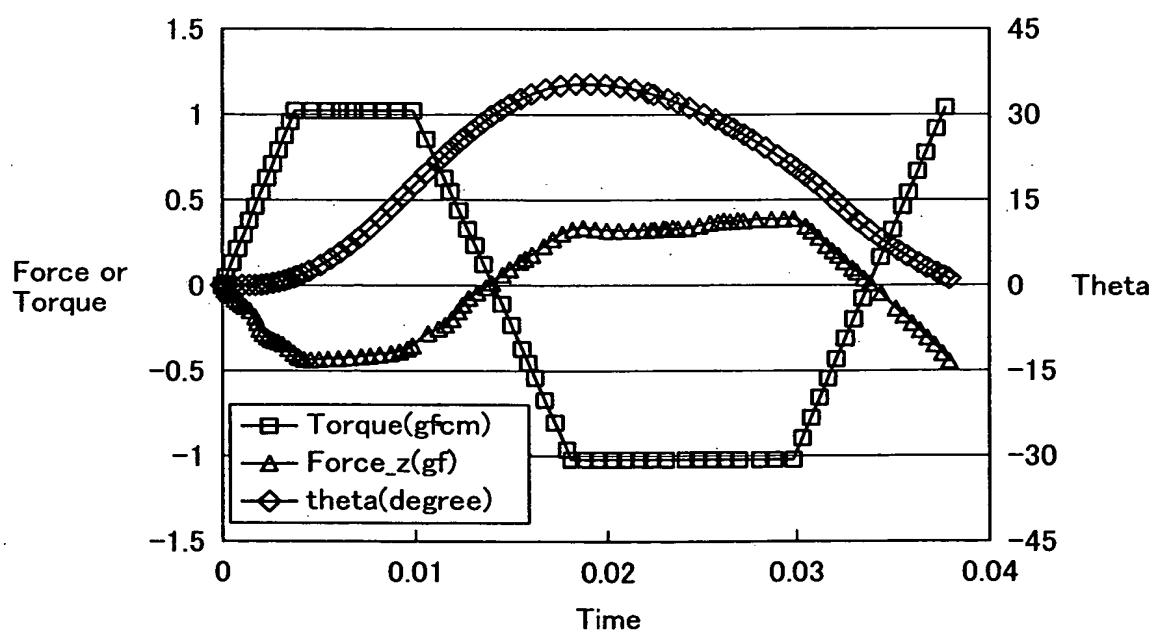


FIG.78

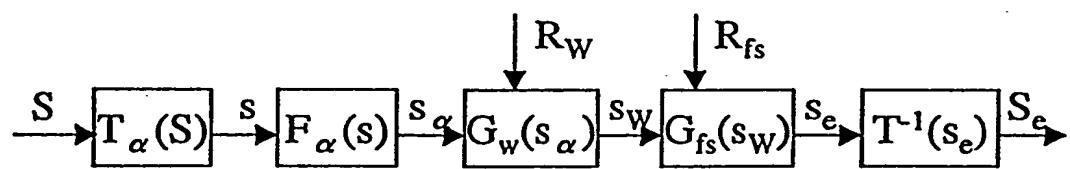


FIG.79

		$x''+$	$x''-$	$z''+$	$z''-$	$\theta y''+$	$\theta y''-$
S1	$\theta$ amplitude large			●			
	$\theta$ amplitude small				●		
	$-d\theta/dt$ large			●			
	$-d\theta/dt$ small				●		
	$-d\alpha/d\theta > d\alpha_{th}$	●					
	$-d\alpha/d\theta < d\alpha_{th}$		●				
	$\beta$ is vertical to down stroke direction			●			
	$\beta$ is not vertical to down stroke direction				●		
	$\beta > 0$	●					
S2	$-d\beta/dt$ large	●		●		●	
	$-d\beta/dt$ small		●		●		●
S3	$\theta$ amplitude large				●		
	$\theta$ amplitude small			●			
	$d\theta/dt$ large				●		
	$d\theta/dt$ small			●			
	$d\alpha/d\theta > d\alpha_{th}$		●				
	$d\alpha/d\theta < d\alpha_{th}$	●					
	$\beta$ is vertical to up stroke direction				●		
	$\beta$ is not vertical to up stroke direction			●			
S4	$d\beta/dt$ large	●			●		●
	$d\beta/dt$ small		●	●		●	

FIG.80

	RIGHT ACTUATOR		LEFT ACTUATOR	
	DRIVING FRQ.	FLAPPING	DRIVING FRQ.	FLAPPING
UP	35 Hz	B	35 Hz	B
DOWN	25 Hz	B	25 Hz	B
GO FORWARD	30 Hz	A	30 Hz	A
HOVER	30 Hz	B	30 Hz	B
TURN RIGHT	30 Hz	B	30 Hz	A
TURN LEFT	30 Hz	A	30 Hz	B